Rock Products

With which is Incorporated **CEMENT and ENGINEERING NEWS** Founded 1896

Chicago, March 31, 1928 (*Issued Every Other Week*) Volume XXXI, No. 7

Attentionless Electric Motors

Once installed, Timken-equipped motors become permanent, attentionless units in your plant. You could forget them, aside from a little lubrication once every few months. Thousands of Timken-equipped motors have given years of such service—many of them on jobs where bearing life was previously limited to months.

Timken Bearings constantly maintain the original gap, without constant attention. Rubbing, burn-outs and shut-downs for motor trouble are eliminated. Dripping becomes a thing of the past. Endurance, dependability, economy, exceed anything ever known.

In respect to bearings any Timken-equipped motor is ready for any conditions! Floor, wall or ceiling mountings make no difference. Type of drive makes no difference. *For load direction makes no difference.* All combinations of radial and thrust loads are equally well provided for by the Timken taper principle.

So much more than merely anti-friction bearings, Timkens are improving motor operating and cost records, just as they are doing in every type of equipment throughout Industry. Savings are so great in many cases that it pays to write off obsolescent motors immediately, installing modern Timken-equipped types. Leading motor manufacturers can supply you.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

SINGLE ROW TIMKEN BEARING

DOUBLE ROW SELF-CONTAINED TIMKEN BEARING

Timkens are more than anti-friction bearings because they have the extreme all-around capacity made possible only by Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken electric steel.

TIMKEN *Tapered* ROLLER BEARINGS

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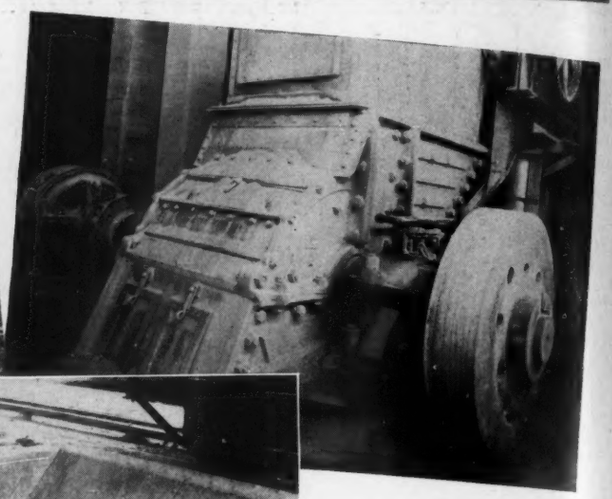
Rock as large as 48 inch is loaded by steam shovel and carried direct to the No. 7 Williams Mammoth Crusher.



Williams Mammoth Crusher at the Trinity Portland Cement Co., Ft. Worth, Texas.

Receiving Hopper into which rock is dumped and then fed by apron pan conveyor to the Mammoth Crusher.

Crushing 48" Rock to 1" with One Crusher

At the new Ft. Worth plant of the Trinity Portland Cement Co., one of America's newest and most modern cement plants—one Williams Mammoth Crusher crushes all the raw material. It takes steam shovel size feed, any rock up to 48 in. and crushes to 1 in. in one operation at the rate of 300 tons per hour.

Operators will recognize in this a big improvement over the old method employing a primary breaker and recrusher with their accompanying elevators, conveyors, drives, and elaborate building requirements. By using a Mammoth crusher first cost is cut 50% to 75% and crushing costs also considerably reduced.

Mammoth crushers are used successfully not only in the cement industry, but also in the reduction of stone for macadam, railroad ballast and other purposes. Can be adjusted to make commercial size rock with no more fines, usually less, than jaw or gyratory crushers. Write for details.

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15 Park Row

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415 5th Street

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PATENT CRUSHERS GRINDERS SHREDDERS

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The Only Paid Circulation Covering the Rock Products Industry

Rock Products

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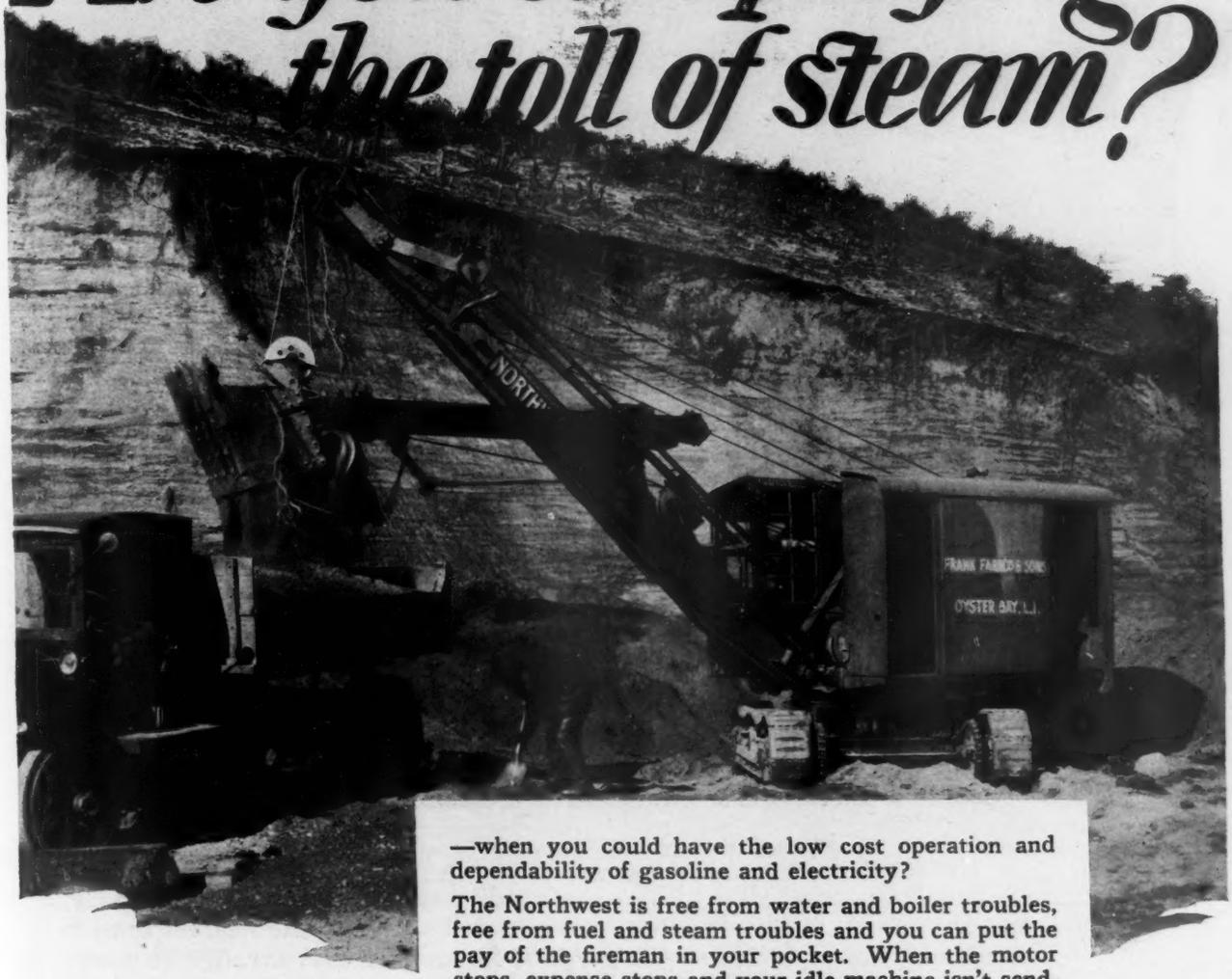

—when you could have the low cost operation and dependability of gasoline and electricity?

The Northwest is free from water and boiler troubles, free from fuel and steam troubles and you can put the pay of the fireman in your pocket. When the motor stops, expense stops and your idle machine isn't sending up dollars in the smoke.

To the quarry or gravel pit Northwest brings the latest in shovel design—the refinements symbolized by motor car construction, a helical gear drive enclosed in oil (no chains to stretch, no spur gears) ball-bearings on all high speed shafts, the big dipper with the flare to the bottom that dumps quickly and the patented cable crowd that does away with power loss through its division between hoist and thrust.

These features mean a lower operating cost in the pit —let us tell you all about them—you incur no bother or obligation—write now.

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline and electric powered shovels, cranes and draglines

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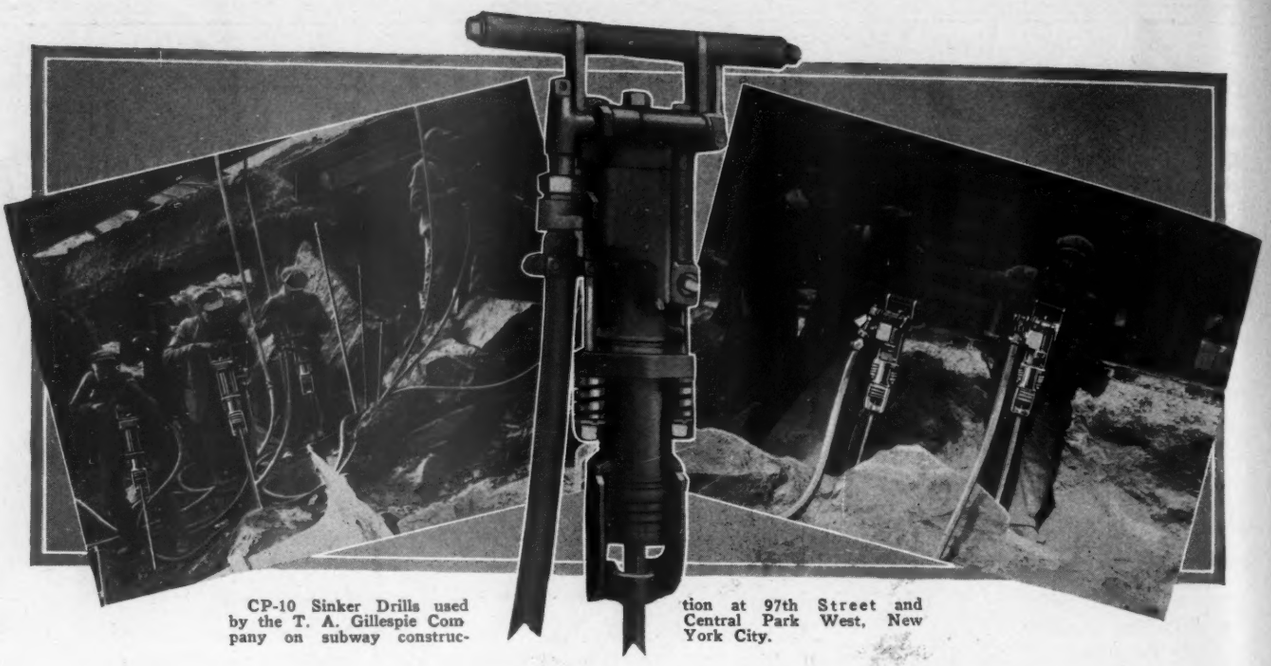

CP-10 Sinker Drills used by the T. A. Gillespie Company on subway construction at 97th Street and Central Park West, New York City.

For High Cutting Speed

contractors are turning to the CP-10 Sinker. These rock drills are easy to operate, well-balanced, low in upkeep and air consumption. Performance records are available which evidence not only an appreciable margin in this respect over competitive sinkers of similar weight and size, but a favorable showing against drills approximately twenty pounds heavier.

The CP-10 Sinker is symmetrical in design, without projecting knobs or bolts, as the valve is housed in renewable bushings in the cylinder wall. Bolts and steel retainer lie practically in the same plane, and the throttle valve is housed in the back head. Supplied in wet and dry types. Economical drilling depth 14-16 feet.

It will pay you to investigate the CP line of drills. Write the nearest branch office for details, and arrange to make a thorough test under your own conditions—in your own way.

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NO BEARINGS ~ NO BELTS SCREEN SUPREME NO OIL ~ NO GREASE

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Most assuredly you would! Whether it's a screen or any other item of plant equipment, the less you have to think about it the more popular that piece of equipment is going to be with you.

The upkeep cost of most heavy machinery is largely determined by the absence or presence of **friction.** The machine, then, in which **all** friction has been done away with, is the one that can be depended upon for operating economy and long life. The Screen Supreme, in its entire makeup, does not use a single bearing cam or pulley. Being electrically operated, its operating parts are so entirely free from friction that oil or grease is never necessary. Once installed, the Screen Supreme will do its work efficiently and with less attention and upkeep expense than any other machine ever designed for similar work.

- Greater Screening Capacity
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- Easy to Install

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No other 2 yard electric shovel has these distinctly Marion advantages.

1. **Enclosed crawlers prevent clogging of belt.**
2. **Outside Type Boom, truss reinforced for strength and safety.**
3. **Inside Type Dipper Handle for long life, efficiency and economy.**
4. **Triple Hitch for increasing cable life and decreasing vibration.**

—and many other profit-making features.

Send the coupon for your copy of 37 Electric Bulletin.

THE MARION STEAM SHOVEL CO.
28024 **MARION, OHIO, U. S. A.**

MARION

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Our Service Department is maintained to demonstrate the proper use and benefits to be derived from these alloys.

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Low Carbon Ferrochrome (in grades, maximum 0.10% to maximum 2.00% carbon)
Chromium Metal
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Miscellaneous Chromium Alloys

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Low Carbon Ferromanganese
Manganese Metal
Manganese-Silicon
Manganese-Copper
Miscellaneous Manganese Alloys

SILICON

Ferrosilicon 15%
Ferrosilicon 50%
Ferrosilicon 75%
Ferrosilicon 80 to 85%
Ferrosilicon 90 to 95%
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Greater strength and durability at high temperatures

CHROME STEEL maintains its strength at high temperatures better than carbon steel. Chrome also increases resistance to oxidation and chemical attack.

Chemists and Mechanical Engineers may prolong the life of equipment subject to corrosion by the use of chrome steel.

We shall be pleased to explain how the properties outlined above may be obtained from the use of Chromium Alloys.

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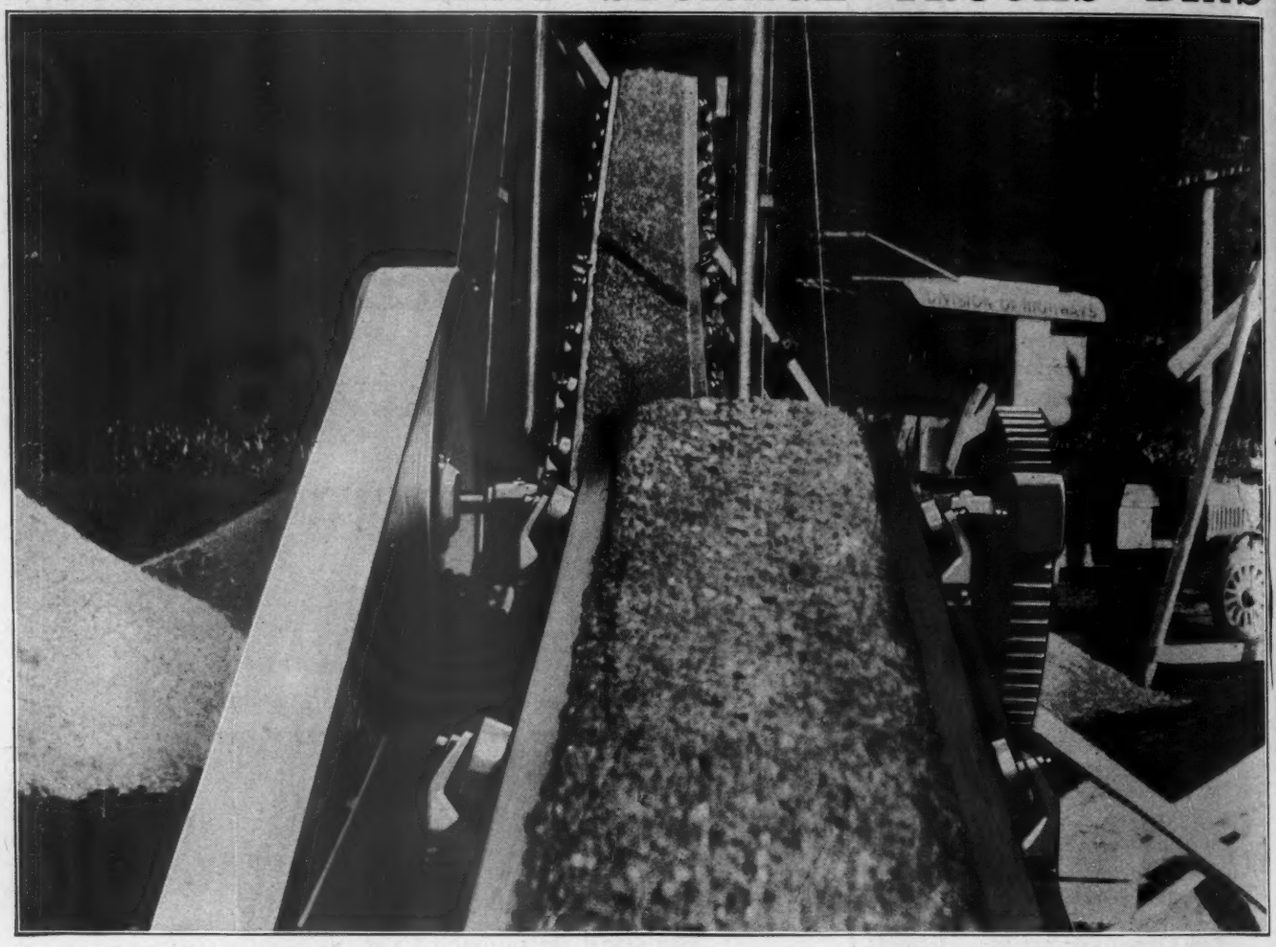
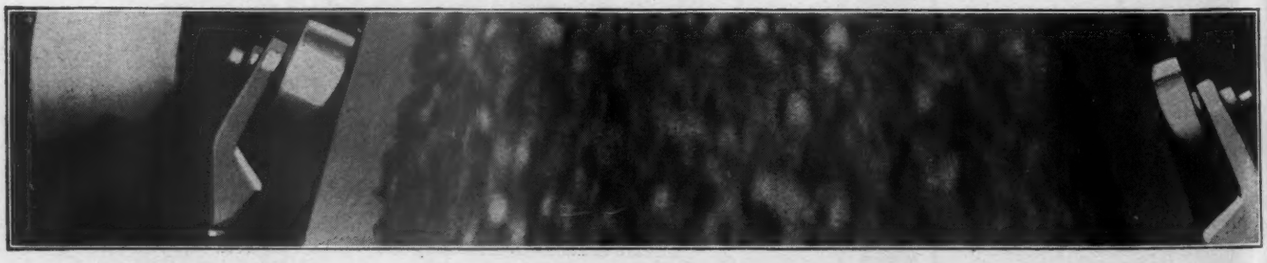


Put Barber-Greene Portable Belt Conveyors to work feeding a continuous stream of sand or gravel into your screening plant, trucks or loading bins, or storage pile—and watch handling costs drop to new low levels.

Hand shovelers are practically wiped out of the picture. The daily output of the pit can be increased. And quicker deliveries are made possible.

The extreme flexibility of arranging Barber-Greene Portable Conveyors makes them ideally suited to most pit operations. In tandem, long distances can economically be covered. And as the work moves in the pit, the conveyors can easily be changed to follow it.

Let us send you complete information on Barber-Greene Conveyors, either portable or permanent, and their adaptability to your particular requirements. No obligation, of course.



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Portable Belt Conveyors 15 feet to 60—standardized permanent Belt Conveyors up to 250 feet.

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Whenever you have a bearing problem our expert engineers will be glad to discuss it with you personally. We will help you to do your thinking.

Add Years of Service

—Save Maintenance Expense With New Departure Ball Bearings

WHEN you find New Departure Ball Bearings in machines it signifies that such machines will do their work consistently, without bearing trouble and with least maintenance expense.

New Departures add years of useful service to the life of gears in the transmission of Galion Master Road Rollers by keeping gear teeth constantly in correct contact.

New Departures take the thrust, radial and shock loads of severe service with the least waste of power, supporting shafts and gears rigidly and permanently without wearing loose and requiring readjustment.

Write for engineering data. Sent on request.

THE NEW DEPARTURE MFG. COMPANY
BRISTOL, CONNECTICUT
Chicago San Francisco Detroit

New Departure Quality Ball Bearings

Still flying the Broom!

"Howdy, Colonel!"
"Why, hello, Jim! Remember the time you had that BUCYRUS on her side at Dump Six?"—

So begins an article by Edgar Young on the life and work of the late General George W. Goethals, in a recent issue of the New York Herald Tribune.

Fresh is the memory of "the Colonel" in the minds of the thousands of men who toiled with him in building the Canal, and as they think of the wonderful work done by General Goethals and his able assistants, they also recall—as he did—the reliable BUCYRUS machines that saw the job through in the face of innumerable vicissitudes.

Old-timers who worked on the Panama Canal can well remember "The Broom," the emblem that shook its bristles from the proud boom of the shovel holding the output record.

And they can remember, too, how this emblem of victory was carried—from start to finish—by the BUCYRUS machines on the big cut. BUCYRUS won that coveted marker with the highest records for daily, weekly and monthly output.

And today, BUCYRUS-ERIES are still proving true to their proud parentage—are still "*flying the broom*" on the world's major construction jobs.

On big railroad projects such as the Canton-Bayard cut-off—where BUCYRUS-ERIES held the output records from start to finish. On the construction of the New Hocking Valley line where more than 60 shovels worked, and again BUCYRUS-ERIES were the yardage leaders from start to finish. On the iron range, in the quarries and coal fields, and on contracting jobs of every size—BUCYRUS-ERIES are "*flying the broom.*"

Having more power to do *harder* work, and do it faster, BUCYRUS-ERIE machines are built with the rugged simplicity that enables them to stand up to the faster pace they set. And as a result, are as widely noted for *Reliability* as for Output.

A Union of Strength

"BUCYRUS" and "ERIE"—each the most successful manufacturer in its particular field—consolidated Jan. 1, 1928. The unmatched resources of BUCYRUS-ERIE assure the buyer of Unequalled Value, More Efficient Machines, Permanence of the Manufacturer, and a More Complete Field Service.

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2 TRAINS - INSTEAD of 3 - SAME TONNAGE with PLYMOUTHS

GASOLINE PLYMOUTH LOCOMOTIVES DIESEL

LANDERS-MORRISON-CHRISTENSON CO.
BUILDING MATERIALS

Minneapolis, Minn., Jan. 18th, 1928

Wm. H. Ziegler Company
619 Washington Ave. S.
Minneapolis, Minn.

Attention: Mr. J. S. Gilman

Gentlemen:

It was our opinion before starting with this new development, that it would be necessary for us to use three trains. Now we find that we get the same tonnage out of these two Plymouth Locomotives that we figured would require three locomotives to haul.

The following is a detailed list of information regarding the performance of these two JLC 12-ton Plymouth Locomotives:

Number of cars hauled per trip: Twelve.
Gross weight of load hauled per trip: 140 tons.
Distance hauled (average): 1 1/2 miles.
Percent of steepest grade (approximate): Two per cent.
Total net weight hauled per nine hour day:
Approximately 1700 tons.
Kind of material hauled: Unwashed sand and gravel.

As you know, our first Plymouth Locomotive was purchased Aug. 16, 1926. Being well satisfied with our experience with this one, we placed our order and received our second one last spring (March 29, 1927), which is evidence of our entire satisfaction with Plymouth Locomotives.

Yours very truly,

LANDERS-MORRISON-CHRISTENSON CO.

By C. H. Young

Exceeding the performance expectations of the buyer may have reduced our sales by one locomotive, but this case is typical proof of the stamina of Plymouths and also further proof of our statement that your haulage costs per ton per year are less where Plymouth Gasoline Locomotives are used.

Landers-Morrison-Christenson Co. are operating two JLC 12-ton Plymouths at a sand and gravel pit in St. Louis Park, about six miles west of Minneapolis. Mr. Young's expectation was that they would have to use three trains of six or seven cars each but with the draw-bar pull developed by Plymouths, found that only two trains were needed using twelve cars to the train.

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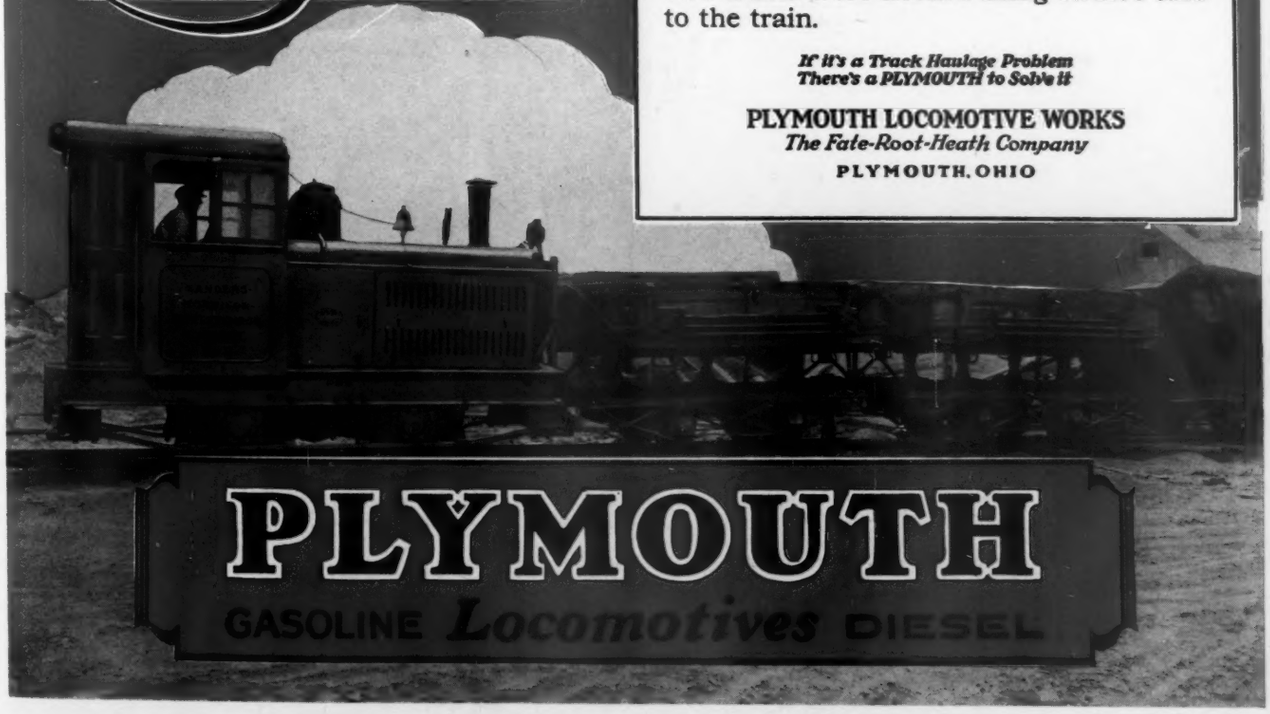
There's a PLYMOUTH to Solve It

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
PLYMOUTH, OHIO



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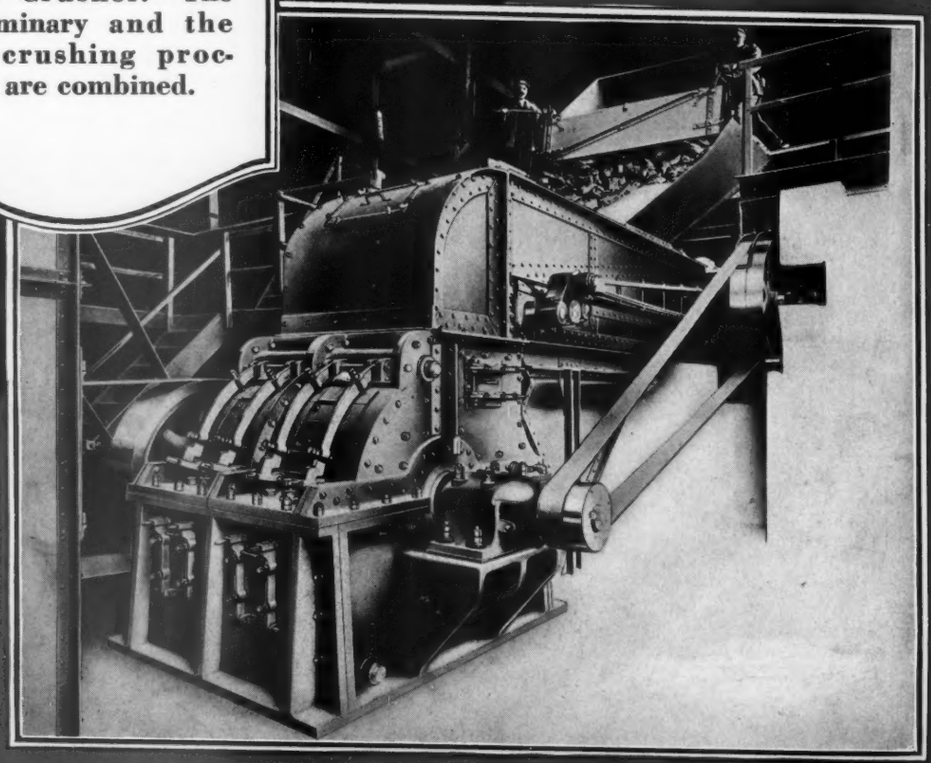
THE Famous SOLO principle, that of one operation doing the work ordinarily requiring two, is embodied in the Polysius Solo Crusher. The preliminary and the fine crushing processes are combined.



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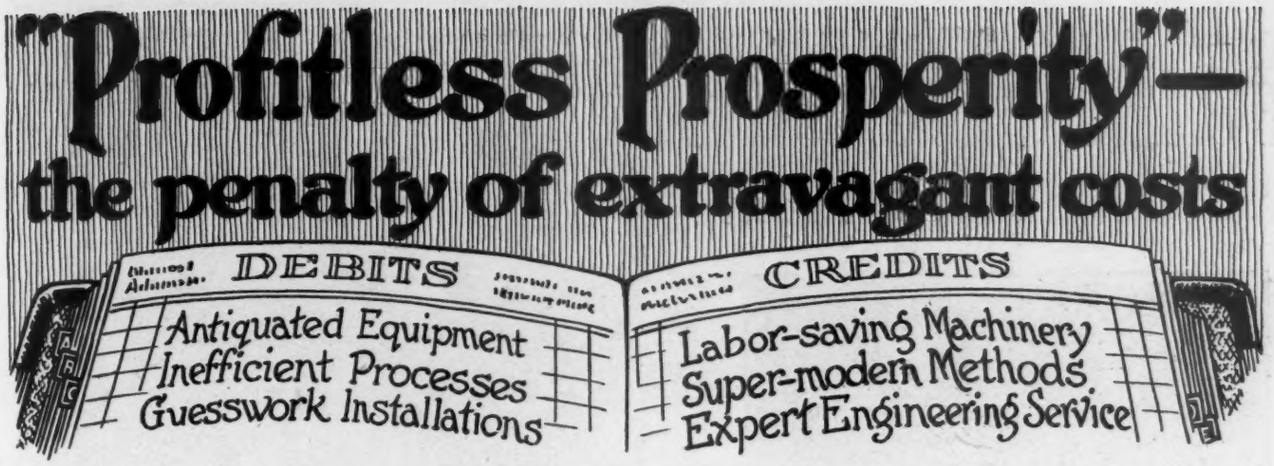

How many plants sacrifice profits on the altar of waste by operating under such conditions as these?—

(a) Equipment in use that demands much supervision and labor—at a time when wages are the highest in history.

(b) Production methods that were out of date long ago, attempting to meet post-war competition with pre-war methods.

(c) Needless waste of the product through losses, spoilage or poor quality of the finished material.

The plant so handicapped has difficulty in keeping production cost below market price.

The one remedy for this profitless situation is thorough revision of methods and equipment.

In the preparation of powdered products, the essential process is the fine grinding of the raw materials.

In this basic operation substantial reductions in cost are possible by Raymond equipment and methods.

RAYMOND MILLS AND PULVERIZERS are furnished with automatic devices which regulate the rate of feed, maintain the machine at capacity, and separate impurities from the product. Thus the labor factor becomes an insignificant item on the cost sheet.

Raymond welded-seam construction of piping, air-separators and cyclone collectors, prevents losses of material and insures ideal working conditions. The air-separation system effects dustless delivery of the product from mill to bin without the use of elevators or conveyors.

THE RAYMOND KILN-MILL introduces still greater economies. It "dries as it grinds" and eliminates separate dryer equipment. Drying-in-the-mill is applicable to present Raymond installations, both mills and pulverizers, including Super Mills which yield from 10 to 30 tons per hour.

RAYMOND ENGINEERING SERVICE insures efficient design of plant layout and equipment, and guarantees specified results. In every Raymond equipped plant, profitable operations are a certainty, with a safe margin between production cost and market price.

We invite correspondence with our Engineering Department regarding your pulverizing problems or equipment requirements.

RAYMOND BROS. IMPACT PULVERIZER CO.

Subsidiary of International Combustion Engineering Corporation

1307 North Branch Street

CHICAGO

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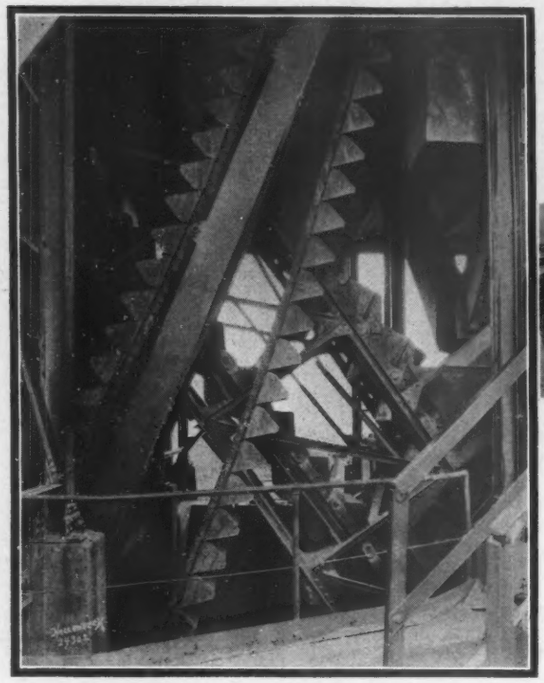
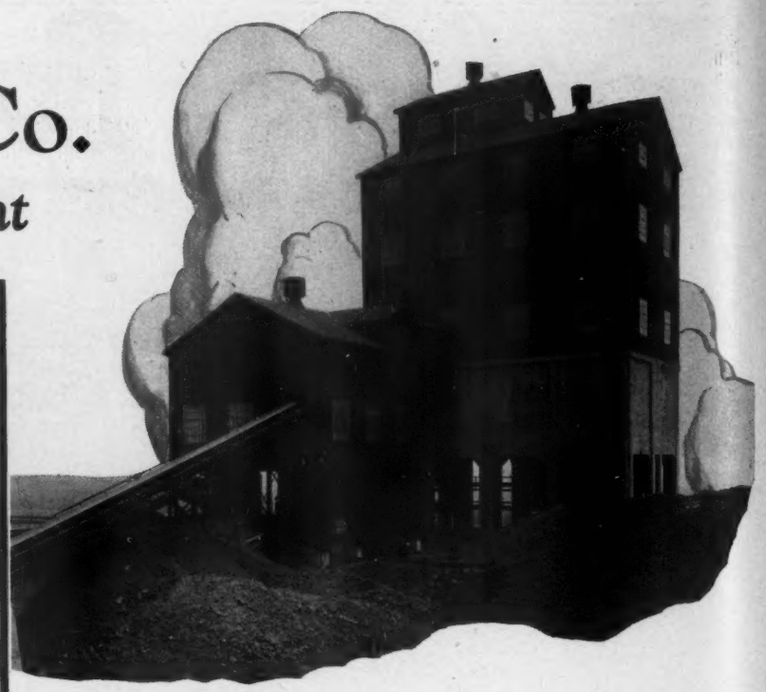
In France Slag Co.

South Chicago Plant





Webster Feeders and Pan Conveyors

MODERN methods of material handling prevail in the new plant of the France Slag Company, at South Chicago, Illinois. In this plant, where are found only the most up-to-date equipment and efficient practices, Webster Bucket Elevators, Plate Feeders, and Continuous Pan Conveyors were adopted.

For years, Webster Material Handling Equipment has enjoyed wide recognition and acceptance as representing the best in its line. Belt Conveyors, Bucket Conveyors, Skip Hoists, Pan Conveyors, Spiral Conveyors, Chains, Sprockets, Elevator Buckets, Screens, Bearings, Friction Clutches and all other items necessary in handling any class of material constitute the line of quality equipment offered by Webster.

For material handling equipment of all types, our engineering and manufacturing facilities are more than ample. Your satisfaction is assured.

THE WEBSTER MFG. COMPANY
1856 Kostner Avenue
CHICAGO

Buffalo Cincinnati Webster-Brinkley Co., Seattle Cleveland New York Philadelphia Webster-Inglis, Ltd., Toronto Pittsburgh

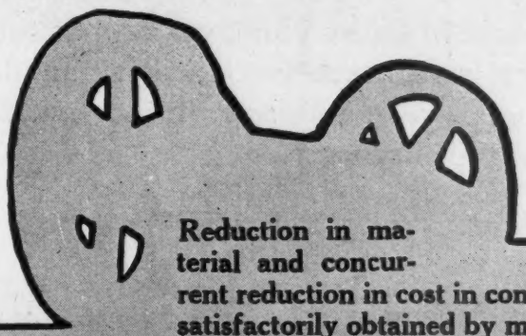
WEBSTER

MATERIAL HANDLING EQUIPMENT

When writing advertisers, please mention ROCK PRODUCTS

Reduction!

Make Costs go down



Reduction in material and concurrent reduction in cost in comparison with other units have both been satisfactorily obtained by means of the

Good Roads No. 1030 Crusher

Big demand for this unit has strengthened our former belief that the design, workmanship, and the complete unit in itself answers the long felt want in the quarry industry.

Manganese steel, special steel side plates, bolted frame, *Alemite lubrication,* and four *Timken* and two *S. K. F. roller bearings* on the eccentric shaft, are all contained in this most advanced crushing unit available today.

Quantity production and low maintenance are the foremost characteristics of the

Good Roads MACHINERY

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Write for Our New Crusher Catalog

The Good Roads Machinery Co.
Incorporated
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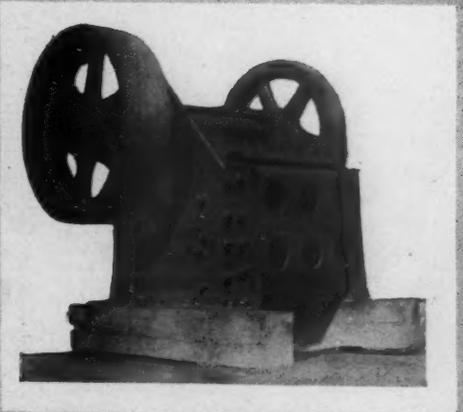
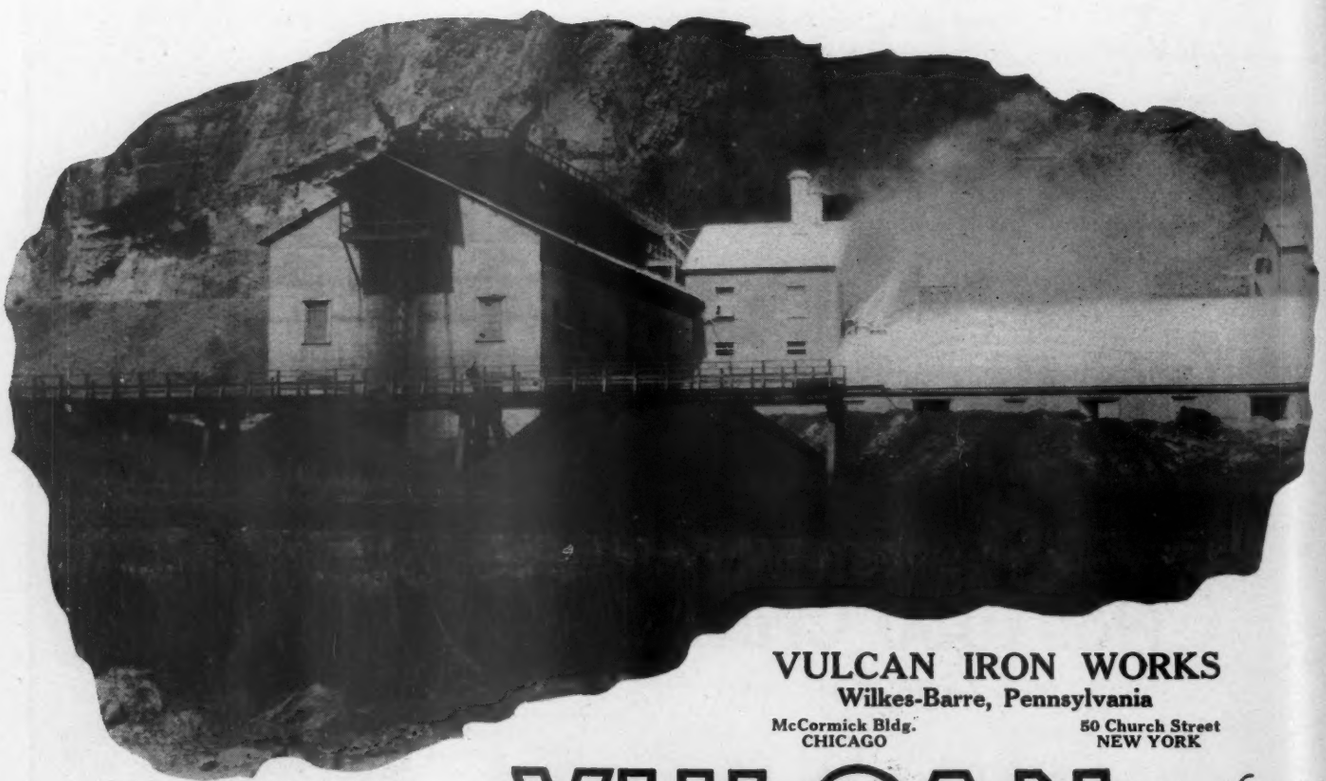


Vulcan Vertical Kilns

VERTICAL KILNS built by Vulcan are the result of long research and actual practice in the manufacture and operation of lime producing equipment. The Vulcan Kiln is the result of a gradual development from the simple shaft kiln. In all details of its present design, it is a kiln which embodies the best features and practices found practicable in present-day lime burning.

Vulcan Vertical Kilns are economical to build, require no complicated auxiliary equipment, and deliver a high ratio of burned lime per unit of fuel used. The design is also such as to facilitate modifications to meet local conditions or the specific requirements of the purchaser.

Bulletin will be mailed on request



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KILNS

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Are you always prepared for NIGHT WORK?

WHEN you have to put a night shift on your construction job, are you prepared with proper lighting equipment? Portable Carbic Light is the most practical light for all-round use.

The Carbic Light is *always ready* —so simple in construction it can be charged in three minutes to burn for twelve hours.

It is *portable*—the popular No. 2 light weighs but 115 pounds fully charged.

It costs only *6 cents an hour* to operate.

Thousands of Carbic Lights are in use today. Your jobber can supply you.

CARBIC LIGHT

OXWELD ACETYLENE COMPANY
Unit of Union Carbide and Carbon Corporation
New York City, 30 East 42d Street — UCC — Chicago, Peoples Gas Bldg.
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CARBIC
REG U S PAT OFF
PROCESSED CARBIDE FOR CARBIC LIGHTS & GENERATORS

Style No. 2

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.

Niagara *Ball and Roller Bearing* Counterflow Screens

Triple deck unit, showing panel being removed from front end. Panels may be removed from either end, and may be equipped with different mesh cloths for various combinations.

Made in four sizes: One, two, and three decks

GUARANTEE that no grit or foreign matter in a wet or dry system can enter our bearings. **GUARANTEE** for one year bearings, housings, seals and main drive shaft. If producer uses clean lubrication and a little care, he should get years of service just as our customers are getting—from gold mines in Alaska running twenty-four hours per day to the largest producers in United States and Canada.

ACTION: A complete rotating motion over the entire Screen body. This rotating action is operated against the flow of material which action immediately separates the material, taking the minus thru, giving a very high grading efficiency.

Let us make tests against anything you have ever had, on any class of material ranging from 8″ opening to 325 mesh.

Write for complete details of this super-efficient Screen

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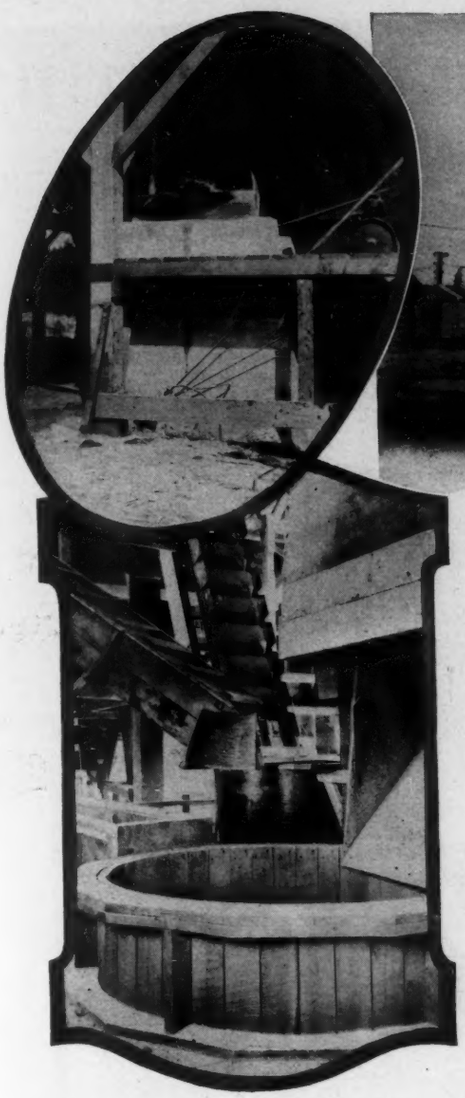

Foley Bros., Inc.
crushing plant, Fort Lee, N.J. designed and equipped by
Telsmith

EXCAVATING for the new Hudson River Bridge required the removal of 500,000 tons of rock—of the hardest kind—trap rock from the Palisades. Foley Bros., Inc. were the successful bidders, largely because, instead of excavating and dumping this rock, they planned to turn it into a profit by crushing it for commercial use.

So hard that it crushes into thin razor-edged flakes, this rock required extraordinary equipment. Speed is essential to every contractor and Foley Bros. had no time to waste. In exactly fifty days from the time their crushing plant was begun it was finished—***complete***—turning out 1000 tons a day.

How was this made possible? Because the plant was ***scientifically designed*** by Telsmith engineers and ***efficiently equipped*** with Telsmith machinery—everything but the electric motors and the jaw crusher was built in Telsmith's factory.

Telsmith Balanced Service is the result of twenty years' experience. It means an undivided responsibility—your plant will be planned, built and equipped by a single organization—experienced, competent and financially responsible to guarantee results. Bulletin Q. P. 11 tells you ***how***. Write for it—no cost or obligation.

Here's the Equipment--

Two 30 in. Telsmith Belt Conveyors; Telsmith Scalping Screen, 60 in. by 12 ft.; two No. 13-A Telsmith Primary Breakers (upper left illustration); No. 9 Telsmith Belt Elevator, 80 ft. long (lower left illustration); two Telsmith Heavy Duty Screens, 60 in. by 24 ft.; two No. 40 Telsmith Reduction Crushers (lower left illustration); Telsmith Duplex Bin Gate, 16x16 in.; seven Telsmith Siquad Truck Loading Bin Gates, 20x18 in.; seven Telsmith Duplex Bin Gates, 20x20 in.; seven Telsmith Siquad Truck Loading Bin Gates, 20x18 in.

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TELSMITH

Q. P. No. 1

The STRENGTH behind every Gardner-Denver Product

Behind every Gardner-Denver Product stands the giant world-wide organization, enormous production facilities and unmatched manufacturing skill that is our heritage as Quality Builders for over sixty-five years.

Such a background naturally gives the low upkeep, continuous service and maximum results by which Gardner-Denver Compressors, Pumps and Air Tools are known to buyers throughout the world.

Check you requirements with our lists—and send for full information.

"QUALITY BUILDERS FOR OVER SIXTY-FIVE YEARS."

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BRANCH OFFICES THROUGHOUT THE WORLD

The Gardner-Denver Company offers the following products, manufactured to one high standard, under one control and guaranteed by one company:

Pumps
- Power Pumps
- Steam Pumps
- Booster Pumps
- Vacuum Pumps

Air Compressors
- Vertical Stationary
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- Electric Hoists

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Concrete Breakers
Clay Diggers
Hole Punchers
Drill Steel
Air Line Oilers
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Governors

GARDNER-DENVER

When writing advertisers, please mention ROCK PRODUCTS

570,000 cubic yards with One Dredging Cutter

This casting is 4′ high and 4′ long with six cutter blades 12″ wide. Notice the layer of Stellite along each side and on the inside and outside surfaces of the blades.

TEN months' dredging before it was pulled for repairs! Yet the cutter it supplanted wore out in six weeks after dredging only 80,000 cu. yds. of material.

Here's how the two cutters differed. Both were made of open hearth steel castings—*but* one casting was coated with 150 pounds of Haynes Stellite. Although the Stellite increased the initial cost about three times, it netted a final saving of nearly two and a half times.

This is typical of the way Haynes Stellite cuts down cost. Wherever a job calls for an abrasion-resisting metal, there is nothing better than Haynes Stellite.

The Stelliting process isn't difficult either. Simply melt a rod of Haynes Stellite in the oxy-acetylene flame and deposit a layer of the metal on the heated surfaces of the wearing part.

Write for our booklet, *Stelliting of Metal Parts in Cement Mills.* It explains the proper procedure in detail.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

Kokomo, Indiana

UCC

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Stelliting with

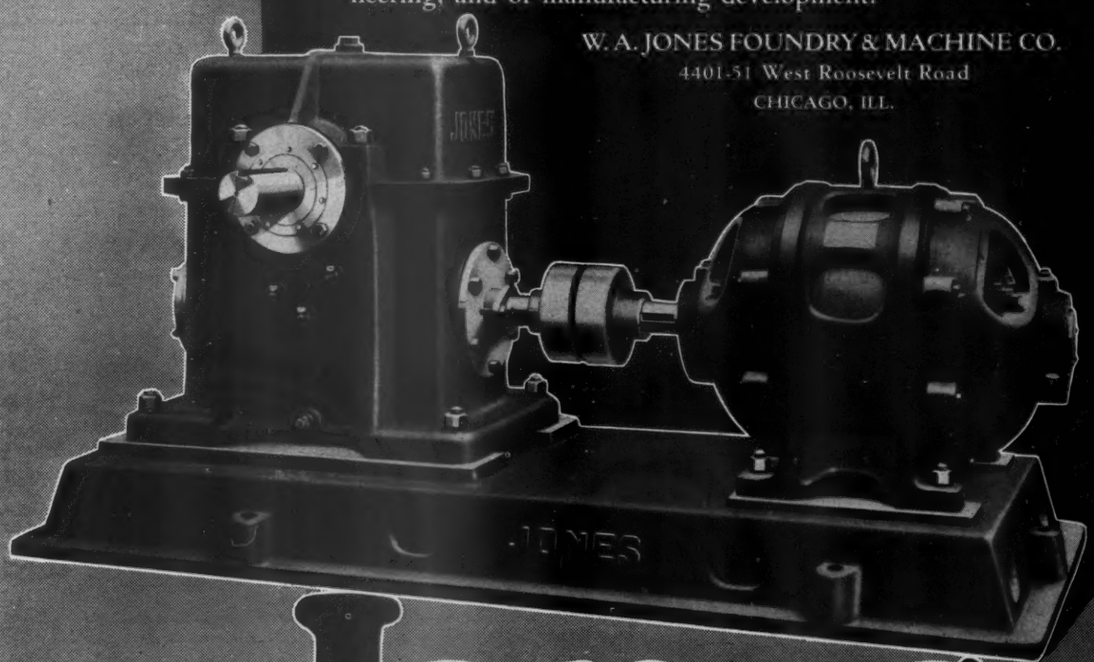
HAYNES STELLITE

A PRODUCT of 15 Years Development

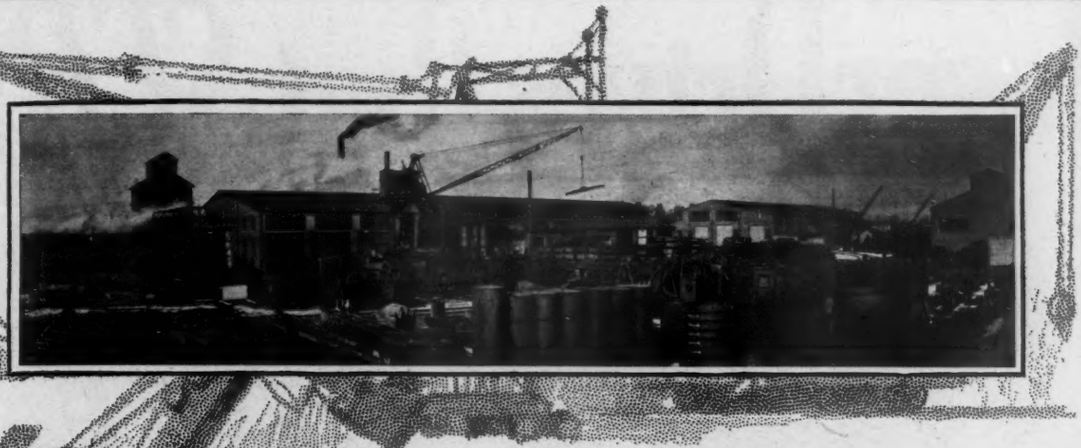
J

For fifteen years, Jones engineers have been working on improved worm gear speed reducers. All this time they have observed and bettered the performances of Jones reducers in many types of installations. Jones plants have introduced new methods and machinery whenever new ways would improve the Jones product. Our fifty-six page catalog is the up-to-date presentation of the results of these years of experience, of engineering, and of manufacturing development.

W. A. JONES FOUNDRY & MACHINE CO.
4401-51 West Roosevelt Road
CHICAGO, ILL.



Jones
WORM GEAR
Speed Reducers



New Standards of Crane and Shovel Manufacture

When a crane or shovel works well and lasts a long time, you can be sure that a great deal of attention was paid to the way it was built—to the materials and workmanship as well as the design.

And just as experience counts in your work, so does it count in the manufacture of cranes and shovels. Every detail must be carefully watched to turn out a perfect job.

That is why the several hundred men who work in the ORTON plant pictured above are qualified to build your equipment. Over 75 per cent of them have worked in this plant at Huntington, Indiana, from 10 to 15 years, building the most complete line of excavating and material handling equipment in the country—shovels, cranes, draglines, ditchers, skimmers and buckets of every type.

And all along the line—from the men in the pattern shop to those on the gear-cutting machines and on the assembly and test floors—they know their work and do it thoroughly. Years of experience have taught them that the best machinery only can be made by careful and intelligent workmanship on every single part as well as the complete assembly.

These men are establishing new standards of manufacture. They are continually setting the pace—making refinements and improvements that contribute to the outstanding value and success of ORTON products on the job.

It is these standards that are your guarantee of performance—of the ability of ORTONS to work well and last long.

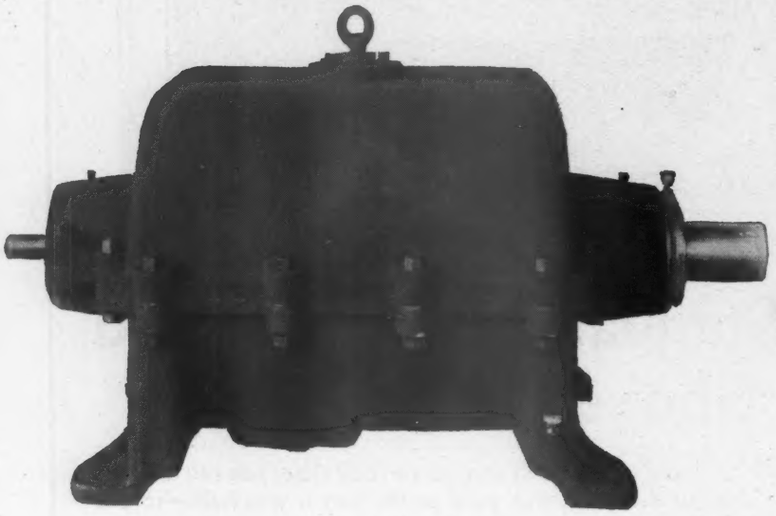
ORTON CRANE & SHOVEL CO.
608 S. Dearborn St., Chicago, Ill.

Manufacturers of Locomotive Cranes; Flexible Tread Cranes, Shovels, Draglines, Ditchers and Skimmers; Truck Cranes; Road Wheel Cranes; Gantry Cranes; Clamshell and Orange-Peel Buckets; Coal Crushers

Representatives in Principal Cities

ORTON
Cranes, Shovels & Buckets

Power Drives that SERVE and SAVE!



EXCESSIVE power losses, incidental to the operation of power driven equipment, are certain to occur, wherever inefficient power transmission methods are used. In many cases, entirely too much power is wasted between the motor and the driven machine. Naturally, power costs go up!

Obviously, with a balanced straight line drive from the motor to the driven machine there can be but very little power lost. Furthermore, the driven machine can be operated at a constant speed, to conform at all times with its speed requirements for maximum efficiency. This is the thing that Huron Speed Reducers give to operators of all types of power driven equipment.

Huron Reducers SAVE on the power bill! And their proven correct design and rugged construction insure long and trouble-free service. In the **long run** it pays to drive with Huron Reducers.

Write for Catalog

Huron Speed Reducer driving apron conveyor in a large cement plant

THE HURON LINE

Huron Speed Reducers
Huron Gravity Seal Rings
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Conveying Machinery
Special Foundry and Machine Work for the Cement, Lime and Gypsum Industry.

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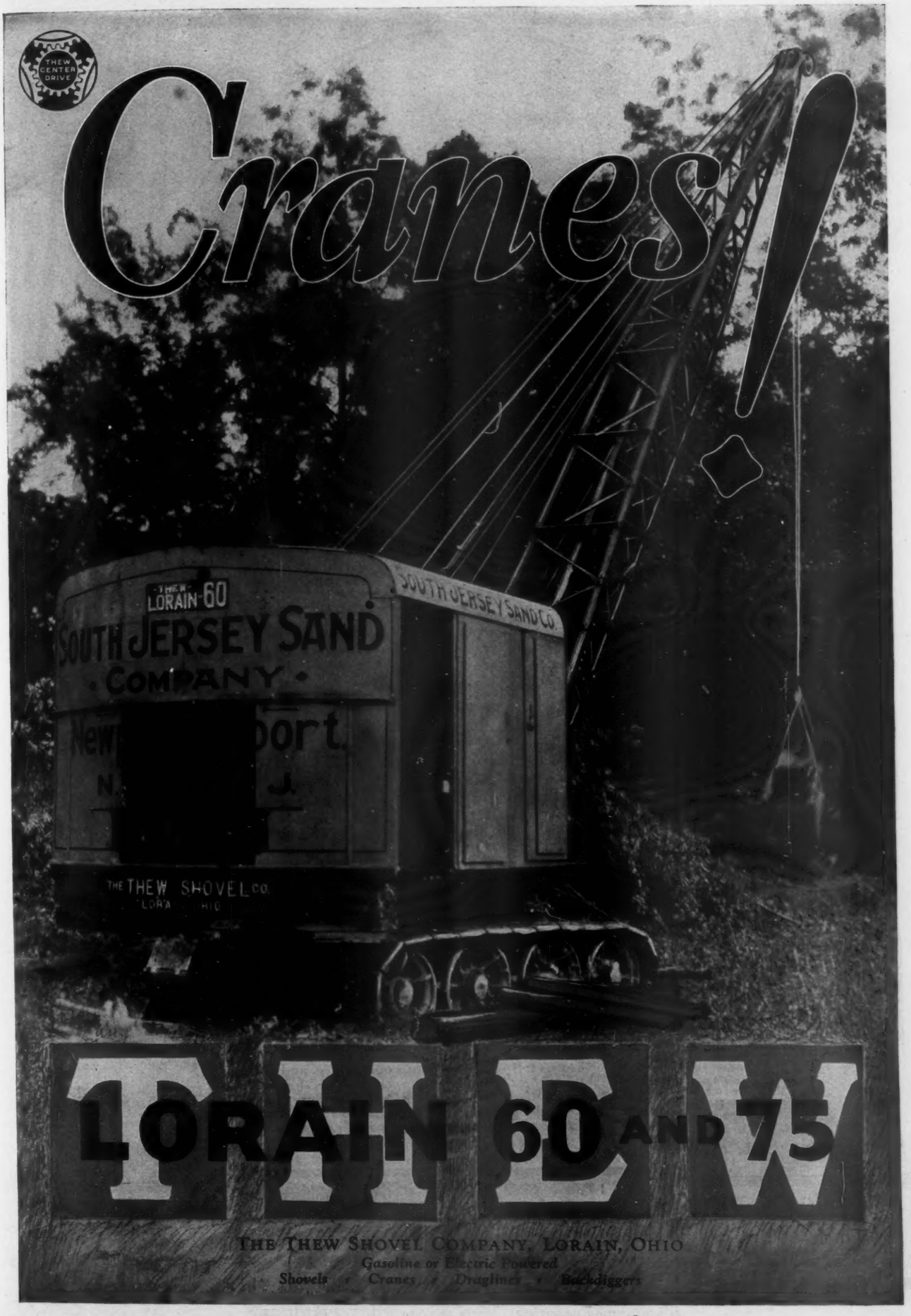
THEW CENTER DRIVE
Cranes!
THE W LORAIN 60
SOUTH JERSEY SAND COMPANY
SOUTH JERSEY SAND CO.
THE THEW SHOVEL CO.
THEW
LORAIN 60 AND 75
THE THEW SHOVEL COMPANY, LORAIN, OHIO
Gasoline or Electric Powered
Shovels / Cranes / Draglines / Backdiggers

DIGGING more than a *million* cubic yards with *one* Amsco Dipper Front is the accomplishment of one large Amsco Missabe Bucket, and we can point to similar records for every type of Amsco Dipper, Amsco Dipper Fronts and Amsco Dipper Teeth. One of the reasons for Amsco superiority is proper design and construction, but the most important reason is Amsco Manganese Steel. Amsco will wear longer under severe punishment and service abuse than any other commercially practical metal. It is all in the special Amsco mix. Many years have been spent in our experimental shops and in the field to produce this advanced Manganese Steel which is truly the "Toughest Steel Known" — and it is now available to you in shock, wear and abrasion-resisting parts for all types of equipment—Dippers—Dipper Teeth—Crane and Shovel Parts—Crawlers—Gears—Sprocket Wheels—Sheaves—Crusher Parts—Chute Liners—in fact we are equipped for excellent service on parts of every description from our many foundries in the industrial centers East and West.

When You Buy – –

Ball and Tube Mill Liners, Crusher, Grinder and Pulverizer Parts, Chains, Sprocket Wheels, Elevator Buckets, Screw Conveyors and Conveyor Case Liners, Gears, Grab Buckets, Crane and Shovel Parts, Tractor and Crawler Parts, Apron Feeders, Grizzly Bars, Pumps, Shock, Wear and Abrasion Resisting Parts for Cement, Stone, Lime, Sand and Gravel Handling Equipment, **be sure they are made of Amsco Manganese Steel for maximum wear.**

Let us tell you more about our service, and remember—*the difference in length of life is the carefully controlled mix—only Amsco Manganese Steel, the "Toughest Steel Known," assures maximum life where shocks, wear and abrasion are encountered.*

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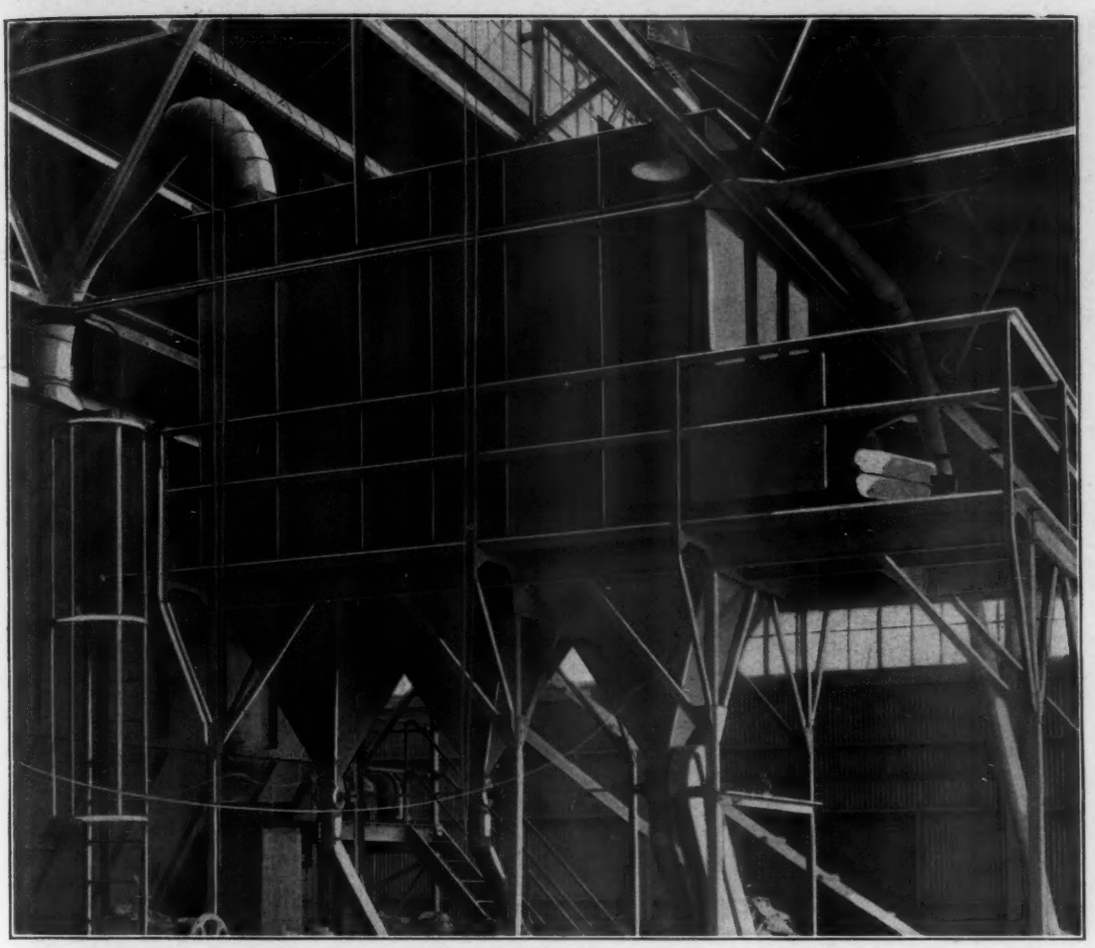


An installation of Sly Dust Arrester in a cement plant.

Standard Equipment in Cement Plants

Cooling Cement

By the application of Sly Dust Arresters, to grinding mills, we have been able to reduce the temperature of the finished cement more than 100° F. Write for details.

Efficient performance—positive dust arrest and an **additional** profit——for those reasons Sly Dust Arresters are now installed in nearly one hundred cement plants.

Dust formerly wasted is now bagged and sold; machinery is protected against the abrasive action of cement dust.

Exhausting dust from baggers and bag cleaners—cooling cement—ventilating finish grinding mills, screens, conveyors—**over 250 Sly Dust Arresters** are used for these purposes.

If you have a dust problem, write for Bulletin S-125, containing a complete description of the Sly Dust Arrester.

THE W. W. SLY MANUFACTURING COMPANY
Cleveland, Ohio

Branches in principal cities. ***Established 1874.***

SLY *Dust Arresters*

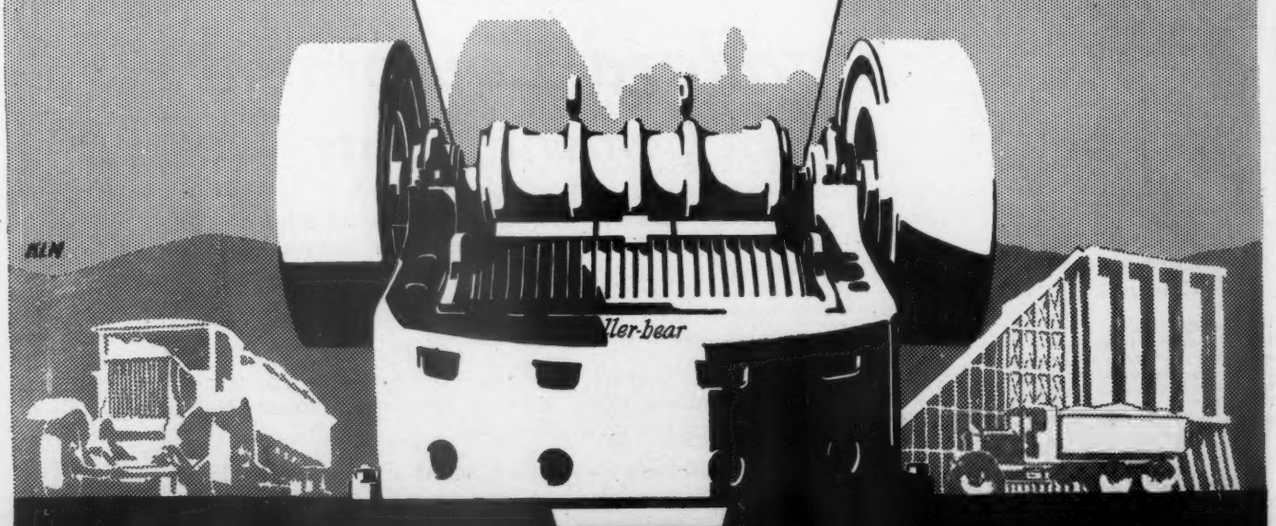
When writing advertisers, please mention ROCK PRODUCTS

—and TIMKEN BEARINGS

Timken Bearings are universally recognized as the best of their kind. They are so well adapted to the heavy duty of carrying a rock crusher load that we feel fully justified in our slogan, "TWO-THIRDS LESS POWER — more capacity".

The Timken Bearings in the Roller-bear Crusher are fitted to the shaft and carried in the frame and pitman. Highly polished, hardened and enclosed against dust and grit. The Roller-bear gives perfect performance and operating economy—and will crush over-size rock to a given size. Send for catalog.

Roller-bear TRADE MARK **Rock Crusher**



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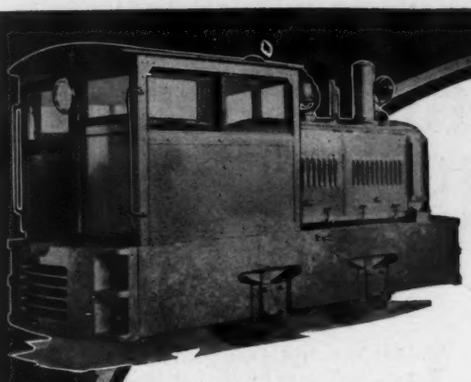


Expenses Become Profits

The Rockford Electric Company, of Rockford, Illinois, faced difficulties in obtaining a regular coal supply. Their track facilities were limited, and they had to depend on the railroads for spotting the cars at the dumping pit. This method was costly. There was invariably an expensive delay, and demurrage charges alone amounted to $2500 per year.

Then they installed their WHITCOMB gasoline locomotive. All of their handling troubles vanished overnight. Switching work was done at need, without delay and without demurrage charges.

Their problem was not peculiar. Many other plants face the same question of getting their supplies moved faster—cheaper—on time.

There is no better answer to this question than a WHITCOMB Locomotive. "WHITCOMBS" afford better and more economical haulage because they are dependable—flexible—ready at a moment's notice—simple in operation—with a very low upkeep cost. Their original cost, too, is surprisingly low.

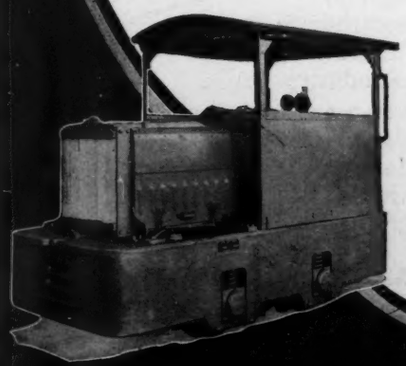
These powerful time-and-money savers are made in any size from 2½ to 50 tons, for any track gauge. Gasoline or electric powered.

Write us and let us tell you how other plants are reducing their handling costs

GEO. D. WHITCOMB COMPANY

Plant at Rochelle, Illinois

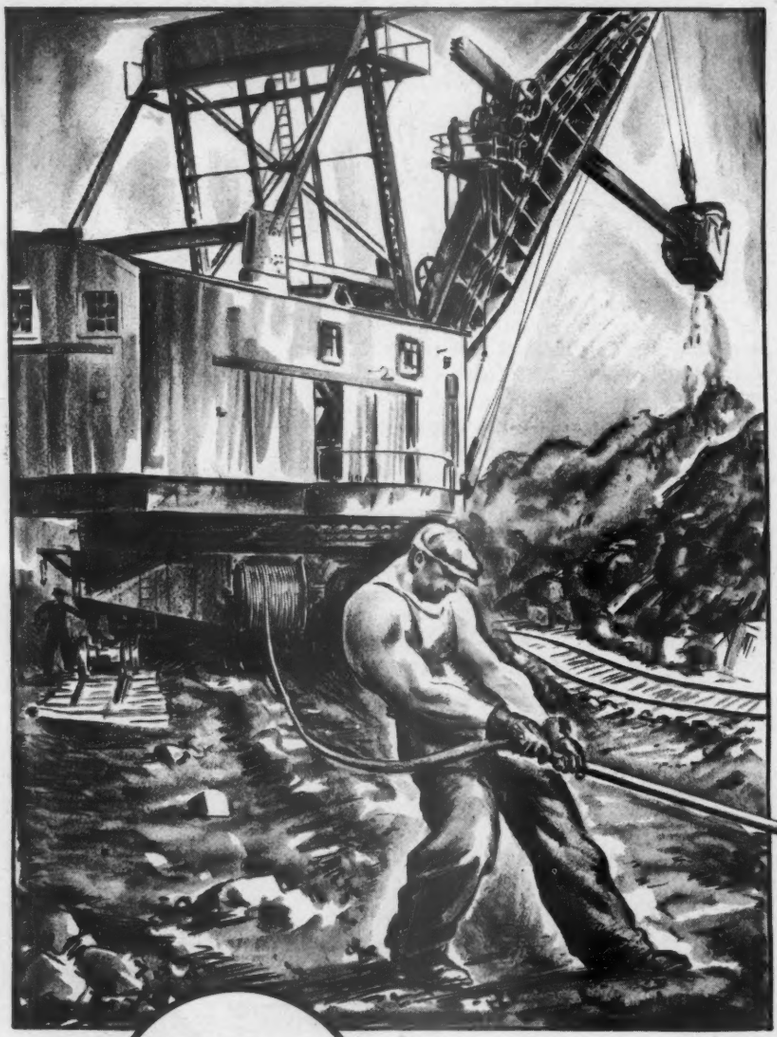
Offices in Principal Cities

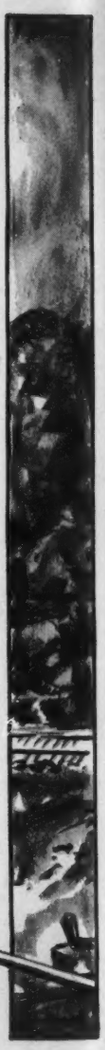


WHITCOMB LOCOMOTIVES

GASOLINE ELECTRIC

Here's the cable that keeps its machines running all the time





INDOORS and outdoors, hot days and cold days, wet days and dry days, Super Service Cords and Cables keep on delivering the current.

You will find them at work in quarries, shops and railroads, in coal mines, salt mines, copper mines, in fact everywhere that portable tools and machinery are used.

They stand up under punishment of all kinds. They are pulled across sharp rock faces, yanked and jerked from job to job. They are soaked in water half the day and baked by the sun the other half.

They stand up under this rough treatment because every foot is vulcanized, in steel molds, under tons of pressure. This vulcanizing centers the conductors in a dense, but flexible, rubber jacket that is waterproof, oil, acid and alkali resistant, and tough enough to protect them from the abuse of daily life in all industry.

If you are using portable cords or cables that wear out too fast, get a length of Super Service and let it prove its longer life.

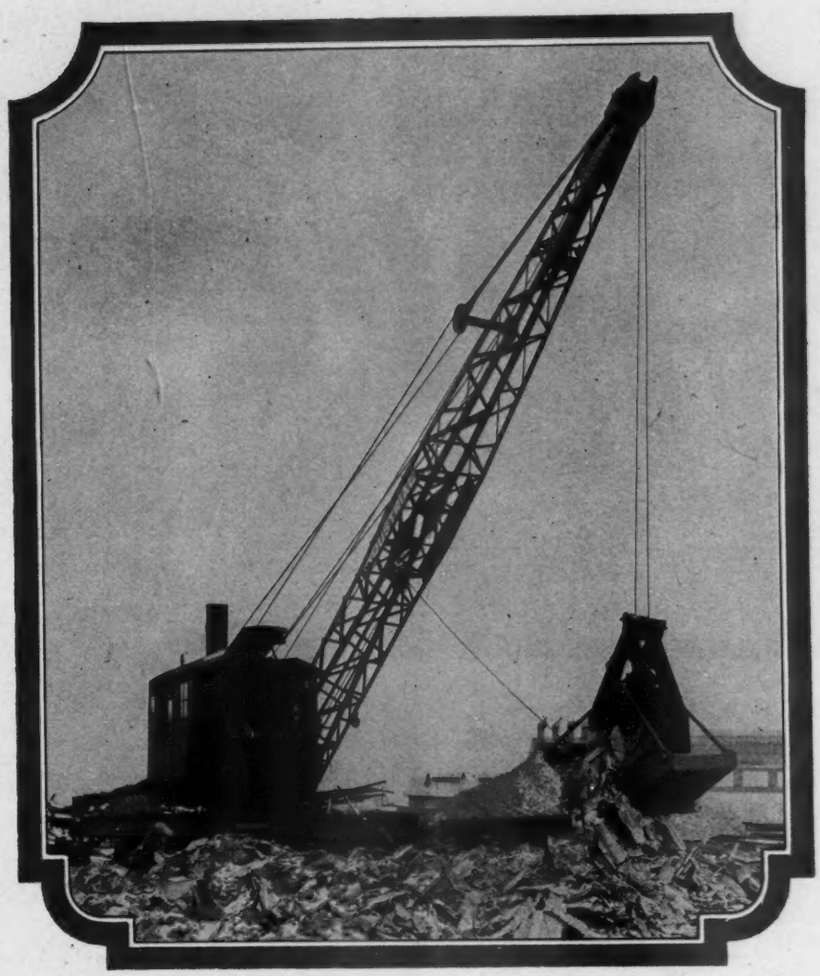
ROME WIRE COMPANY
DIVISION of GENERAL CABLE CORPORATION
Rome, New York

SUPER SERVICE
CORDS and CABLES

ROME WIRE

2307

FROM WIRE BAR TO FINISHED COPPER WIRE



Save 50% Handling Lumpy Materials

Many companies are paying at least double what they need to for unloading lumpy materials from cars and for handling it in and out of storage. This is proved by records where Industrial Brownhoist cranes are handling coal, ore, limestone, coke and similar materials at less than half the cost of former methods.

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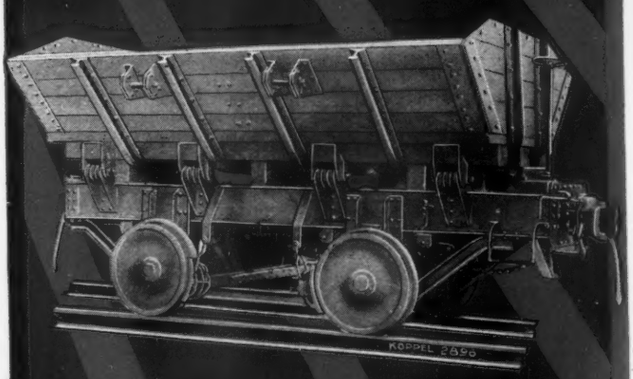

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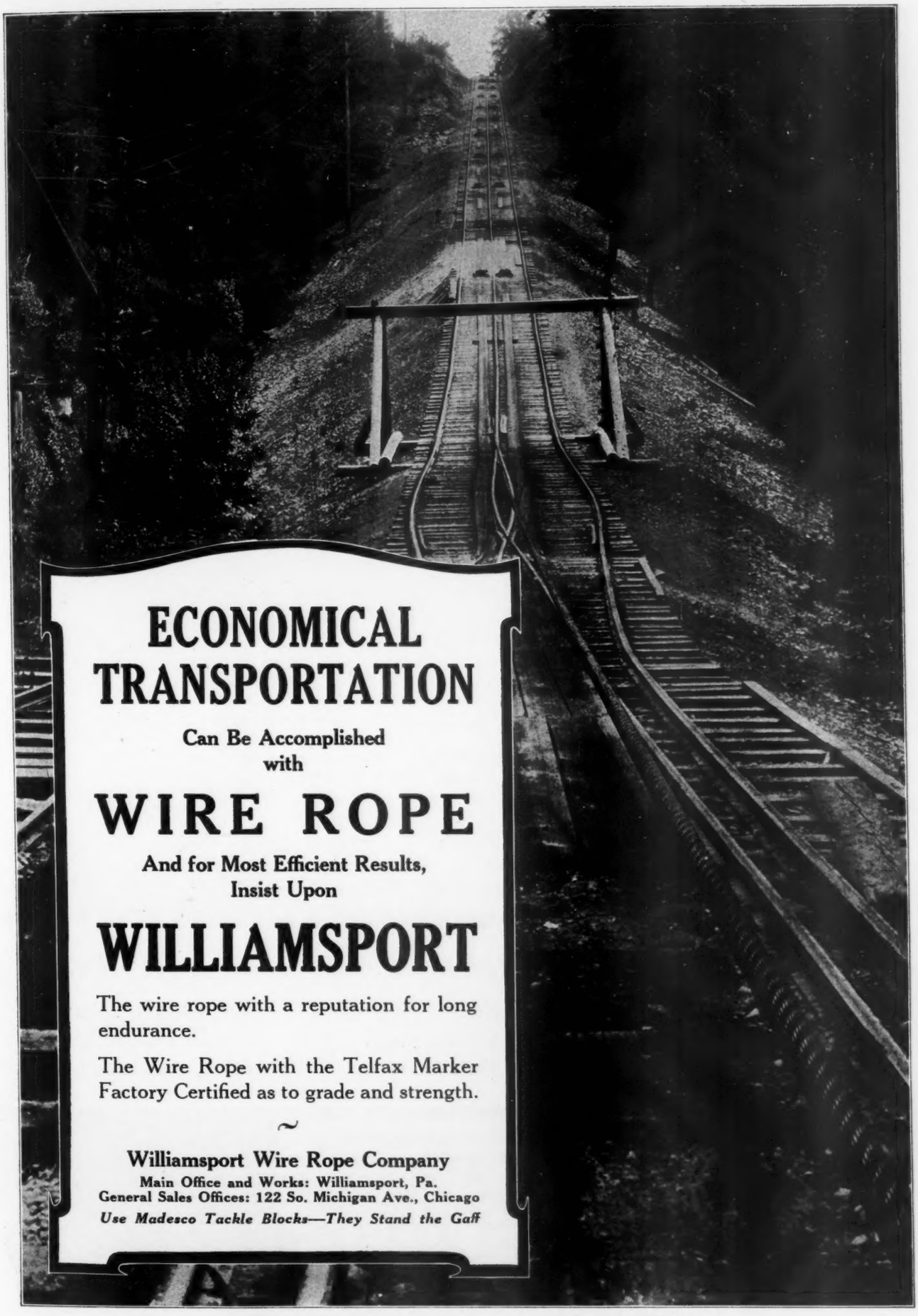
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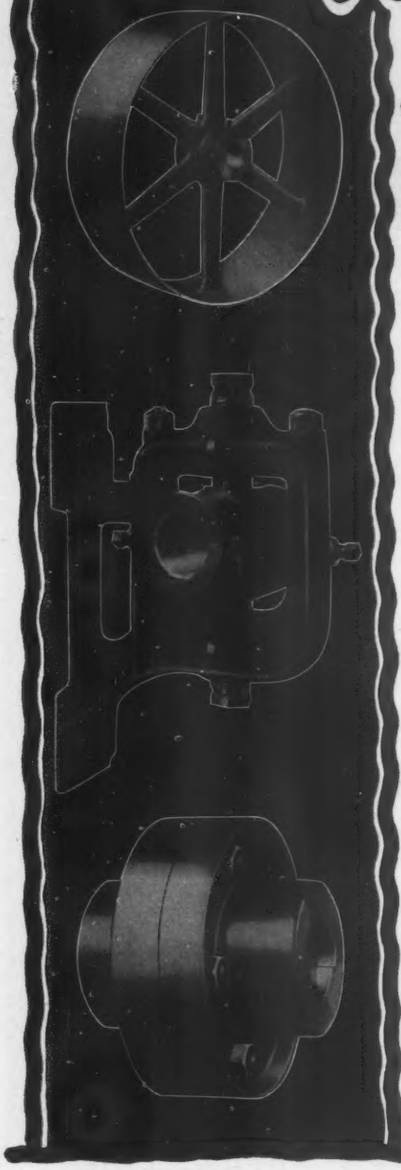

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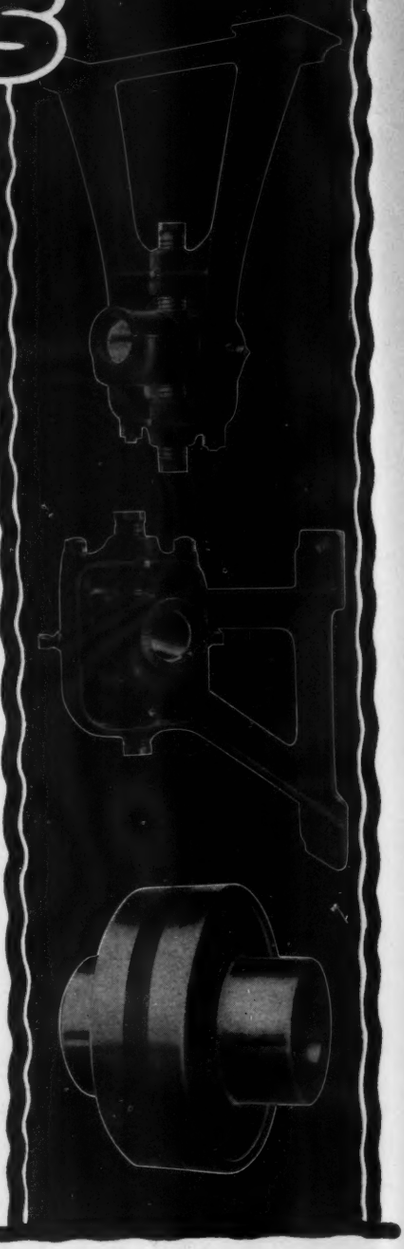

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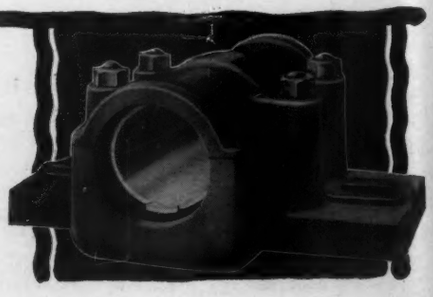
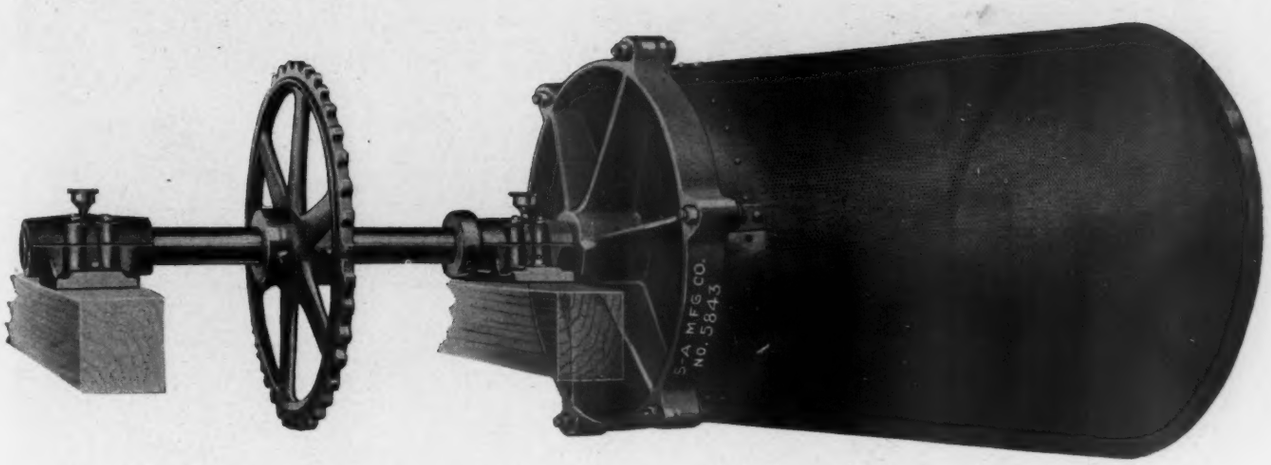
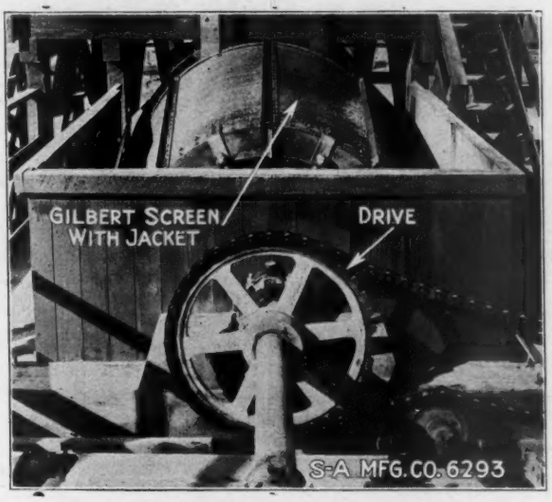


S-A GILBERT SCREEN



Screens and Washes in a Single Operation



Gilbert Screen Installation
The outer jacket shown makes an extra separation of the fines passing the Gilbert perforations

The small end of this screen is closed, the large end is open, and the inside is entirely free from any obstructions which might interfere with screening action.

Aggregate is chuted inside the screen to the small end. Meeting the revolving screening surface here the material works its way by gravity to the open end. As the screen increases in diameter the material is thinned out and by the time it reaches the open end every particle has been passed over the perforations many times.

During this screening process jets of water through the open end meet the tumbling mass, loosening and removing the dirt which passes away with the wash water.

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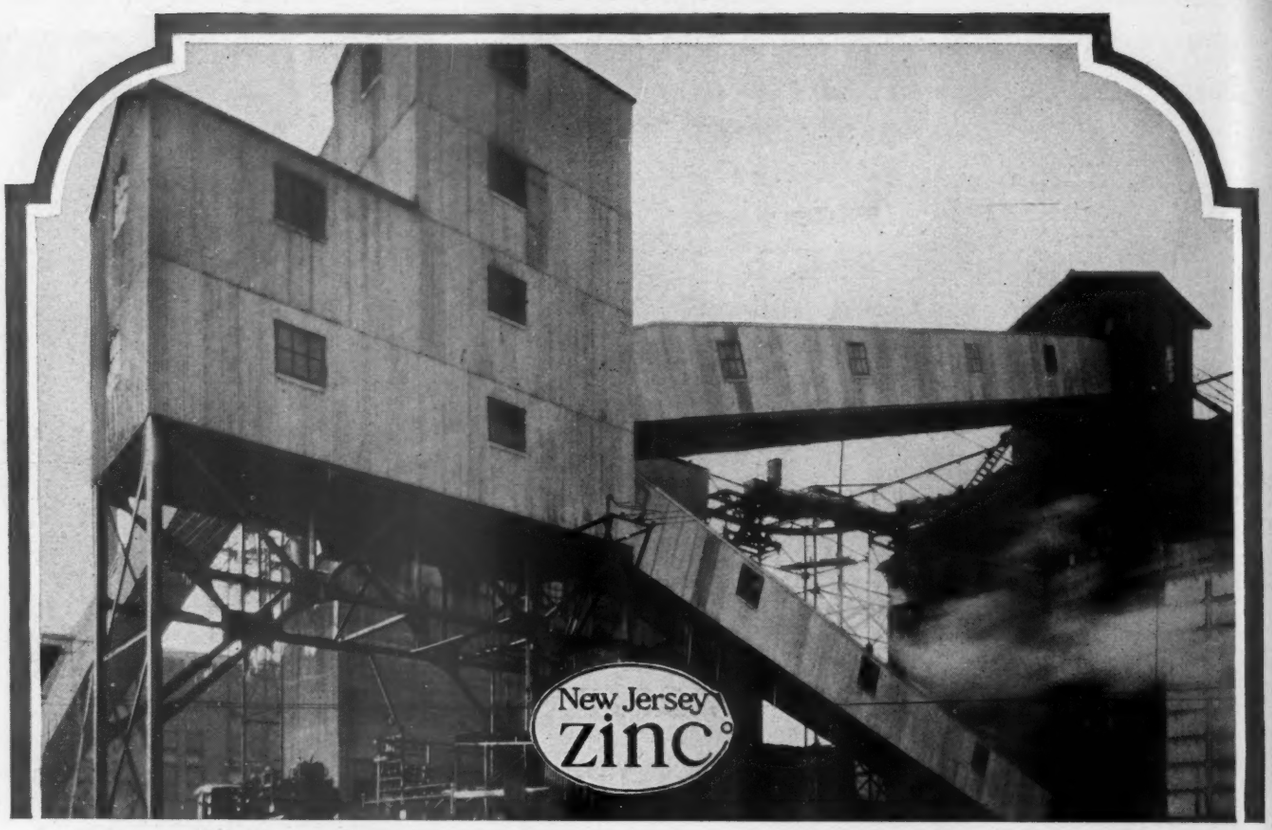

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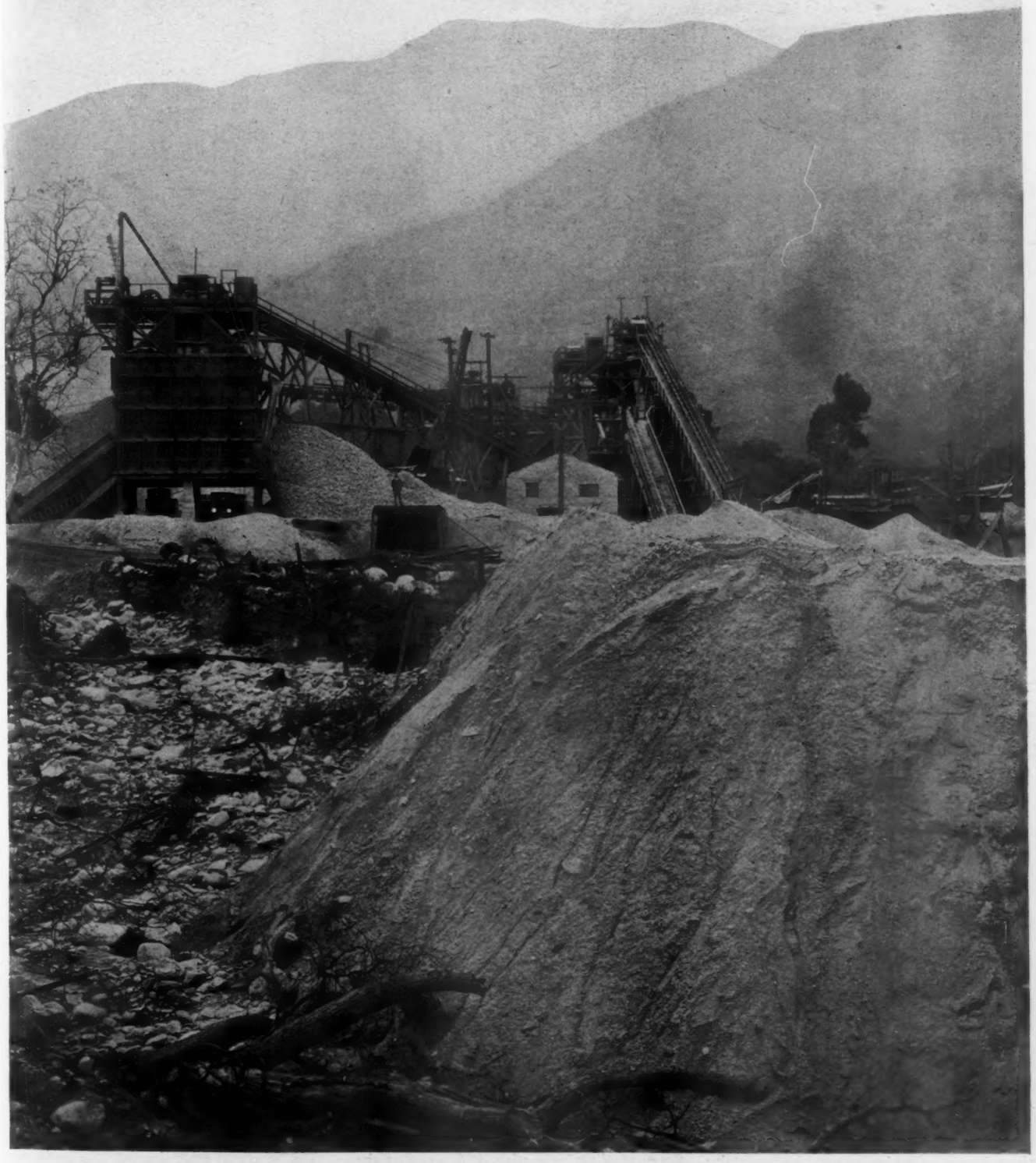
Volume XXXI Chicago, March 31, 1928 Number 7

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896



General view of the gravel and crushed stone plant of the Eaton Canyon Rock and Sand Co., near Pasadena, Calif.

Typical California Gravel Operation

Eaton Canyon Rock and Sand Company, Pasadena, Calif., Makes Crushed Stone, Gravel and Sand—Trucking Operation Exclusively

By James N. Hatch
Pasadena, Calif.

Plant of the Eaton Canyon Rock and Sand Co. from the south, with the receiving hopper at the right connected by belt conveyor to the scalping screen over the rock storage bunkers at the left

TURNING out crushed stone and screened and washed sand and gravel at the rate of 100 tons per hour and 18 hours per day is what may be found almost any day in the year at the plant of the Eaton Canyon Rock and Sand Co., located in the Eaton Canyon wash, Pasadena, Calif.

The output from this plant, which is handled entirely by trucks, consists of four grades of crushed stone, two grades of gravel and two grades of sand. Haply the materials as taken from the bank are naturally so proportioned between coarse aggregate and sand that there is no surplus of sand and the only waste byproduct is the dust and stripping, which are in comparatively small quantities.

This plant is located in the bed of a dry stream where the wash of ancient geologic times has brought down from the mountains a practically exhaustless amount of granitic materials, from boulders too large to handle, to sand suitable for plaster. The Eaton Canyon Rock and Sand Co. leases the property, and pays the owner on a royalty basis. To say the location is in a dry stream is not altogether correct, for during times of great rain storms the water comes rolling down this arroyo in great volume, so that the craters that have been made from the excavation in the summer are again filled in with the wash from the mountains and the supply is in reality exhaustless.

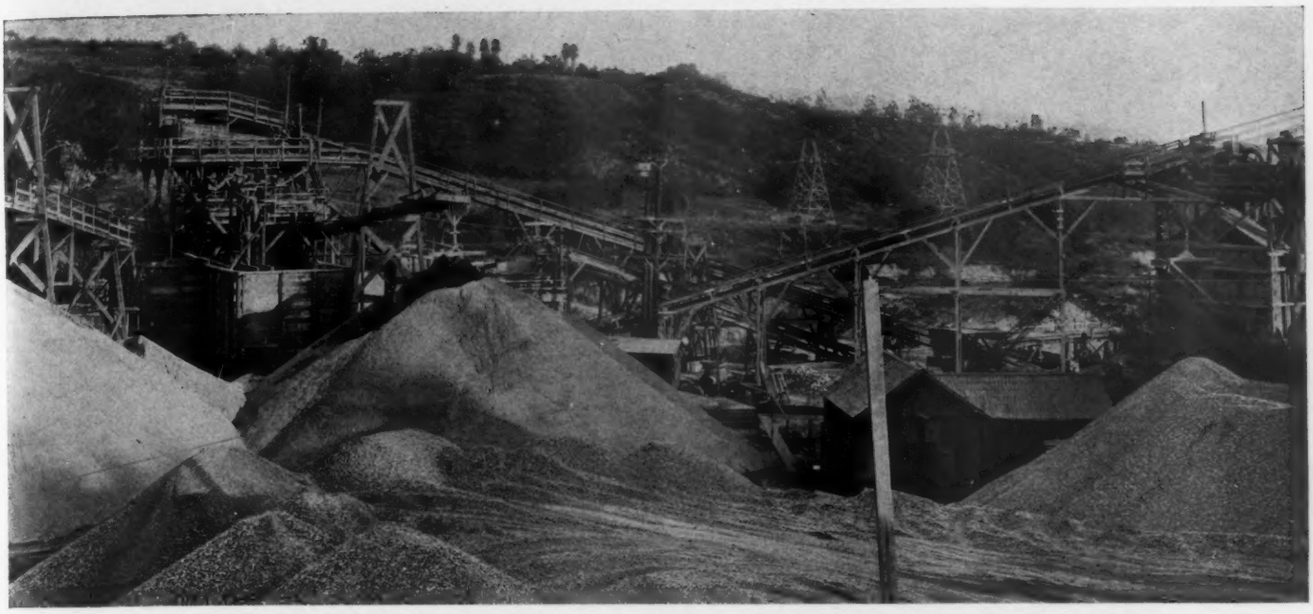
Bank Excavation

The excavation from the bank is done with a Northwest 1-yd. gasoline power shovel which loads into 5-yd. side-dump cars. The shifting of the cars is done with a Plymouth 8-ton gasoline locomotive, which pushes the cars up to the foot of an incline. The dump cars, two at a time, are then pulled up a 15% grade with a Thomas electric hoist and dumped into the receiving hopper.

Primary Crushing

The materials as dumped from the cars fall upon a Allis-Chalmers apron feeder, which feeds them onto an inclined bar-grizzly with bars 5 in. apart. This grizzly takes out the large boulders which roll down the iron bars into the jaws of a No. 10 McCully primary gyratory crusher, which crushes them down to 4 in. or under. The reason for such a large crusher is not on account of the amount of material passing through it, but because a large opening is required to take in the large size boulders that are encountered.

The crushed rock leaving the primary



View of the sand washing and screening plant (left) showing sand storage piles in the foreground. The rock crusher is at the right

crusher is taken on a belt-conveyor up an angle of 18% to the scalping screen, a revolving screen which removes some of the dust and takes out the oversize rejects. The rejects from this scalping screen go to a secondary crusher which will be referred to later.

Handling the Crushed Gravel

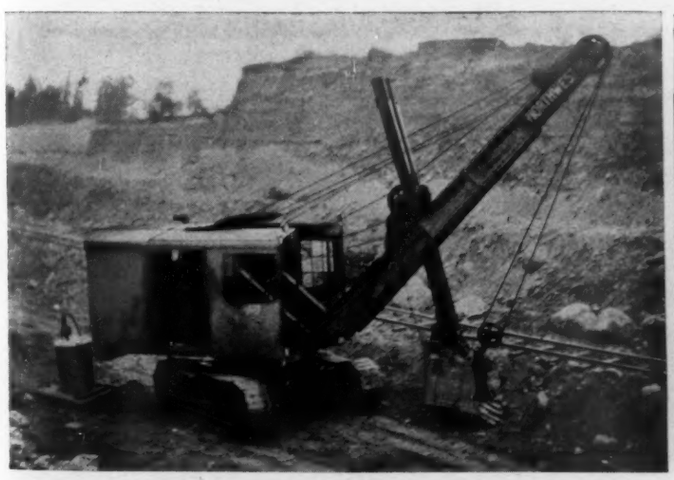
Now to return to the bar-grizzly. The materials passing through the grizzly are carried by a belt-conveyor up a 16% incline to the top of a bunker and pass through a scalping screen where all the stones that will not pass through a 2-in. screen are rejected to a No. 6 McCully reduction gyratory crusher. The rejections from both of the scalping screens go through this secondary crusher. From this crusher the materials fall on the same belt-conveyor that had received the materials passing through the scalping screen from the primary crusher, and all of the rock products are carried together up to the storage bunkers for rock storage. Here the rock materials pass through a sizing screen which eliminates the dust and segregates the materials into four sizes of crushed rock as follows: (1) No. 4 or ¼-in. crushed rock passing through ½-in. round holes; (2) No. 3 or ¾-in. crushed rock passing through 1⅛-in. round holes; (3) No. 2 or 2-in. crushed rock passing through 2¼-in. round holes; (4) rejects from this screen, the largest size, No. 1 crushed rock passing through 4-in. round holes. This is the material that was sized through the scalping screens mentioned above. The dust jacket on this screen is covered with wire cloth 5-mesh, No. 14 wire.

Sand and Gravel

Now returning to scalping screen No. 2, the materials that pass through the 2-in. round holes on this screen are carried on a belt-conveyor up to a set of Gilbert screens where they are washed and segregated into the following sizes: 1½-in. gravel, ¾-in. gravel, concrete sand and plaster sand.

The gravel is stored in bunkers underneath the Gilbert screens, where it is reclaimed by means of tunnels through which the trucks are driven. Hand-operated, steel, sliding gates are used for discharging into the trucks. The two classes of sand are separated by two differently sized holes in the jackets of the Gilbert screens and are run through two dragline classifiers. From the classifiers the sand is deposited on two belt-conveyors and carried to the respective sand storage piles. The loading out from these sand piles is also done through tunnels. The very fine sand and dirt are washed out of the classifiers by a stream of water which carries this waste material back into the arroyo.

The proportions of different grades of materials from the entire plant are about 40% crushed rock, 24% gravel and 36% sand.



1-yd. gasoline power shovel excavating material from bank

Storage piles along the bank and reclaiming crane

As this is about the proportion of the several kinds of material that is used in the market it is not necessary to waste any of the material, as is often the case in sand and gravel plants.

An All-Trucking Plant

The trucks after receiving their loads in the tunnels stop over a platform scale and are weighed and then proceed up a long grade to the top of the river bank, and then to their destination. Where materials are being produced in excess of the immediate requirements they are hauled up to the top of the bank and dumped back down into storage piles. This stored material is reclaimed at the bottom of these piles. Stored materials as well as materials which are beyond the flow into the tunnels are reclaimed by two portable loading machines. One of these machines is a Northwest gasoline crane with a ¾-yd. clamshell bucket. The other is a standard Barber-Greene gasoline bucket elevator loading machine.

Storage bins for crushed rock, showing loading tunnels below

The company has one truck of its own for work about the plant, but the delivery trucks are all leased and are chiefly owned by individual owners. About twenty 5-yd. trucks are employed for delivering material, most of which is used in the city of Pasadena and surrounding territory.

Side-dump cars unloading to trap over sloping bar grizzly and primary crusher

Much of the materials that are to be used for street and road paving, commonly known as batch mix, are mixed at the plant and the mixed material delivered to the job. Materials to be mixed are hauled in trucks to the top of the bank and dumped back into bunkers for each class of material. From these bunkers each assortment of material is let out into measuring boxes where it is measured and then mixed in the specified proportions. This mixed material chutes directly into the trucks at the low level.

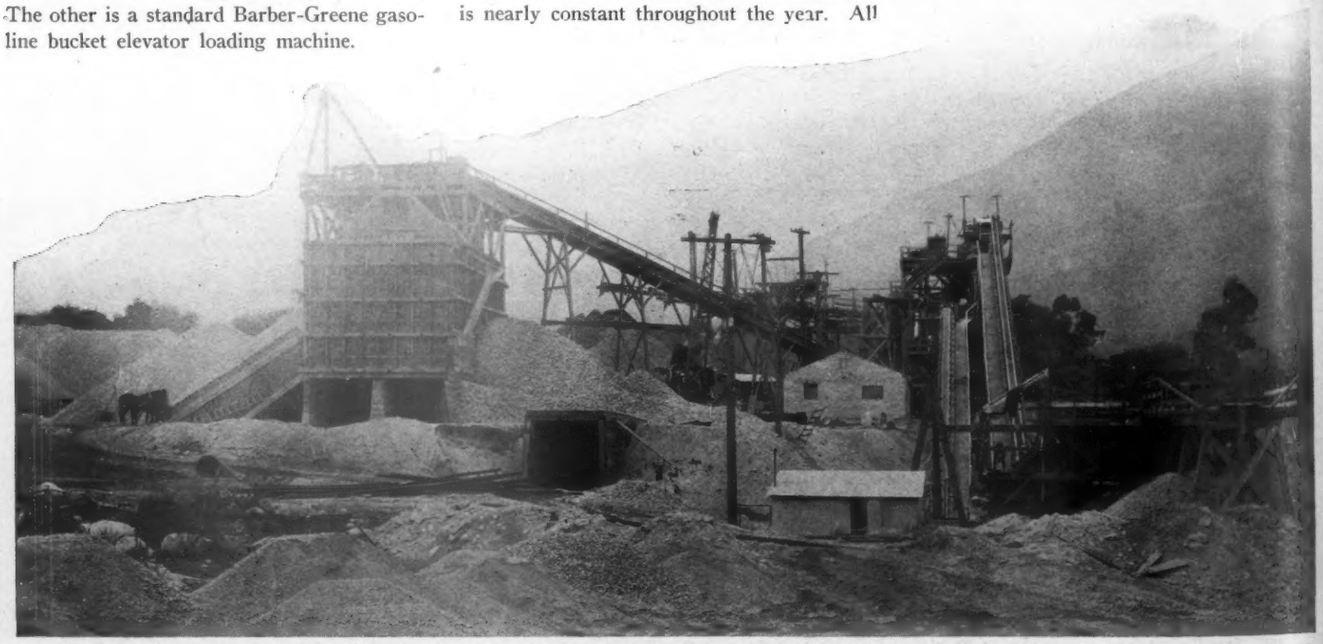
This plant is operated in two 9-hour shifts for most of the entire year, and the output is nearly constant throughout the year. All deliveries are made in one 9-hour shift. Nineteen men are employed all together for the two shifts, not including truck drivers.

Goodyear conveyor belts are used throughout the plant and the operated at speeds of from 100 to 300 ft. per minute. Transmission belts are of the Thermoid make.

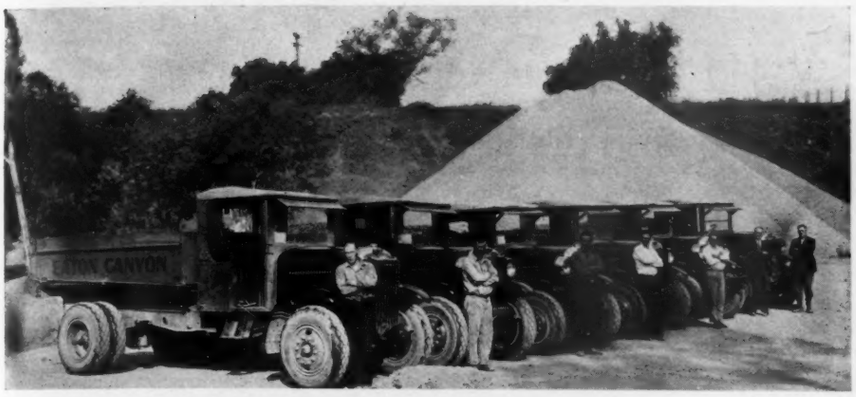
Water for the entire plant is obtained from a 555-ft. well and is pumped with a Pacific vertical, centrifugal, motor-driven pump. About 400 gal. of water is required for washing with an output of 100 tons per hour. The crushed stone is not washed.

Except as mentioned, the entire plant is operated electrically. Energy is purchased from the Southern California Edison Co. and is delivered at 6600 v. This is stepped down to 440 v. for the motors.

Market for materials in southern California is quite uniform during the entire year



View of the unloading trap at the right, showing belts for carrying material to the scalping screen, and another conveyor to take material from the secondary crusher to the rock storage bunkers (left)



The trucks which deliver the materials. Some of these have compartments for different materials

and there is little variation in prices. Prices quoted by the Eaton Canyon Rock and Sand Co. are: Crushed rock, $1.10 per ton f.o.b. plant; gravel, $0.95 per ton, and sand, $0.65 per ton. These prices are subject to $0.10 per ton discount for cash payment on the 10th of the month following the month of delivery. Prices delivered on the several construction jobs is plant price plus the cost of hauling.

The Eaton Canyon Rock and Sand Co. is a partnership in which the partners are J. S. Lutes and L. J. Hopkins of Pasadena. The plant superintendent is T. P. Mulvaney.

Physical Properties of Principal Building Limestones

A REPORT, which is part of the general investigation dealing mainly with the physical properties of building stone, has just been issued by the Bureau of Standards under the title, "Physical Properties of the Principal Commercial Limestones Used for Building Construction in the United States," by D. W. Kessler and W. H. Sligh. The materials studied are those now in use, some of which have a wide distribution and others which are produced mainly for local demands.

The conclusions drawn by the investigators based on their tests are given below:

1. The compressive strength of 130 samples tested for this report, representing materials from seven states and 42 quarries, varied between 2,500 and 28,000 lbs./in.^{2} Tests made on the stone in both the dry and wet conditions indicate that, as a rule, limestone is about 10% weaker when thoroughly wet than when dry.

2. Transverse strength, tensile strength, and shearing strength bear a rather definite ratio to the compressive strength, but some materials have planes of weakness which influence these properties to a greater extent than they do the compressive strength.

3. Absorption values expressed by the weight ratio vary from 0.03 to 12%. The absorption of limestone is proportional to the total pore space, but when the stone is once thoroughly dry a long period of soaking is necessary to completely fill the pores. Absorption tests on several specimens which were soaked for six months showed that the pores were less than nine-tenths filled. In the two weeks' immersion test the average saturation obtained was 0.7.

4. Impact tests were made to compare the toughness properties of the different limestones, which gave values ranging from 3 to 7. The materials showing more resistance to this test are less apt to become defaced in the lower parts of buildings where subjected to accidental impact.

5. Modulus of elasticity measurements in compression show values ranging from 1,500,000 to 12,400,000, which indicates that the rigidity of this class of materials varies from one-twentieth to approximately one-third that of structural steel. The average ratio of E determined from the flexure test to E determined from the compression test in this series was found to be 0.75.

Thermal Expansion

6. Thermal expansion measurements over a temperature range of approximately 300 deg. C. indicate that the rate of expansion increases with the temperature; hence the assumption of linear expansion for this material is erroneous. For normal seasonal temperature ranges the coefficient of expansion for the typical limestones may be taken as 0.000005 per degree centigrade, which is about one-half that of structural steel or reinforced concrete. It has been shown that higher stress may be produced in the stonework of a stone-faced, steel-frame building by differential expansion of the materials than is ordinarily the case from dead loads.

7. Studies of the permeability of limestone and comparison of this property with porosity values indicate that the rates at which water will flow through different stones are not proportional to the porosity values.

8. Unit measurements indicate that the larger part of the limestones now in use for building purposes vary from 140 to 150 lbs./ft.^{3}, with an average of approximately 146, only the densest limestones reaching the weight of 168 lb.

9. Discolorations are mainly from two causes, viz., those which penetrate from external sources and those which are leached from the stone. Brown discolorations, which frequently occur over large areas of limestone buildings, are usually due to organic impurities in the stone.

10. Efflorescence is due mainly to three causes: First, water-soluble salts in the masonry being leached out by percolating water; second, soluble salts in the ground water being carried up into the lower parts of buildings by capillarity; third, water-soluble salts from soot which are leached into the stone by rains. The more common salts found in efflorescence on masonry are sodium sulphate, magnesium sulphate, and calcium sulphate. The disintegrating effects of efflorescence is due to the wedging action of crystals forming in the pores of the stone.

11. Freezing tests indicate a great difference in the resistance of various limestones to frost action. The less resistant materials were disintegrated by 100 freezings, while some withstood 2,900 freezings. Although high strength and high density appear to favor the resistance of stone to frost action, tests indicate that these determinations are not always reliable for judging the resistivity to such action.

12. Artificial weathering tests which are intended to simulate the action of frost by causing a salt to crystallize in the pores are not always dependable.

13. Chemical weathering due to the acid conditions of rain water is not usually appreciable except on delicate carved parts of the limestone which are freely exposed.

Action of Pure Water on Cement Mortar Briquets

LONG-TIME tests made by French engineers to determine the action of various waters on briquets made of cement mortar, reports *Le Génie Civil* in a recent issue, show that distilled water has a decidedly disintegrating effect on such mortar specimens, whereas river water with a calcareous content has no effect whatever. The tests were made in the laboratory of the Société des Chaux et Ciments de Lafarge et due Teil upon specimens made from six types of cement in ordinary commercial use. The results, the laboratory reports, were practically identical on all mortars, whether made of portland cement or analogous cements. The cements used included natural, slag, limestone, quick-setting and high-alumina. The tests covered a period of approximately 100 weeks. The only briquets to resist the disintegrating action of distilled water were those made of high-alumina cement, known as *ciment fondu*. At the end of 100 weeks, when all of the other briquets had become badly pitted by the continuous action of the water, *ciment fondu* was scarcely affected.—*Engineering News Record.*

Sand Settling and Devices for Settling and Classifying Sand

Part III.—Calculating a Surface Current Settling Box

By Edmund Shaw
Editor, Rock Products

THE application of the theory of settling and the use of the falling rate may best be shown by some practical examples of figuring settling areas. The commonest settling device to be found in the rock products industry is a settling box designed to settle out concrete fine aggregate, whether natural sand or crushed stone screenings, from a stream of water carrying clay and silt. It is always desired to remove the clay and silt and usually it is desired to remove some or the fine sand.

In calculating settling boxes and the like it is not necessary to figure closely. The falling rate of grains, as we have seen, is only an average figure with many grains that fall faster or slower than the average. The quantity of water used varies almost as much as the falling rate, for the flow varies according to the amount of solids contained and the condition of the pumps and the pipes or flumes through which the water runs. So the best we can do is to design for average conditions with a margin that will make it certain the settler is not too small. Then it is easy to cut down the settling area by putting in baffles and partitions until the right sizes are caught in the settler. For the same reason, certain factors, such as the friction of the water on the sides of the settling tank, will be disregarded altogether. Their effect is so slight that this may be done safely.

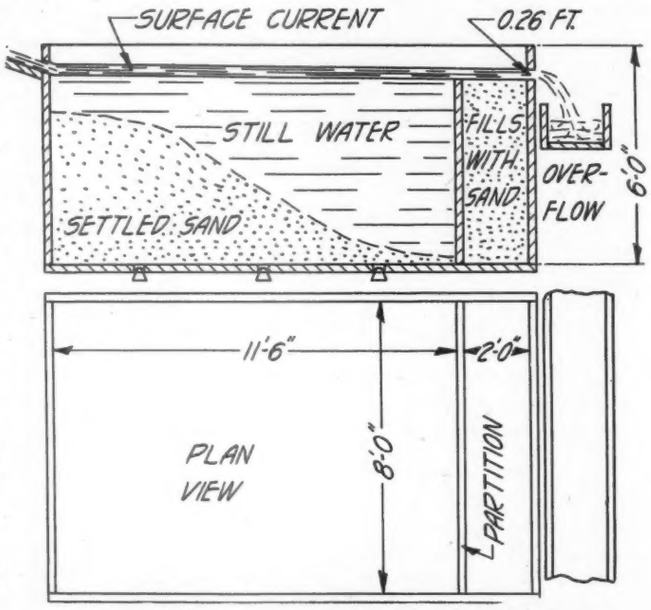


Fig. 10. Settling box in which the particles fall from a surface current to the piles below

A settler of the type to be designed is shown in longitudinal section in Fig. 10. The water flows across the settler and the grains of sand which are heavy enough fall out, making a pile as shown. At intervals this settled sand is drawn off through the holes in the bottom, which are shown here closed with plugs, although usually some kind of valve is placed in them. The water carrying the clay and fine sand flows over the end into a flume or launder (both words are used) and is then carried away to waste.

The upper part of the box is covered with a sheet of flowing water and the effect of this flow is felt a short distance below. But under this the water is still. Any grain that falls out of the flowing water into the still water will fall without much horizontal movement to the bottom of the box.

Every grain of sand in the flowing stream is acted upon by two forces, gravity, which makes it fall through the stream and the carrying effect of the water in motion.

The rate at which it falls through the stream is its falling rate, which may be found from the table or the curves of falling rates. The velocity at which it is carried by the water may be taken as the velocity of the stream. This is not true of the carrying of the coarse grains, but it is sufficiently near the truth to be used for the fine grains, which are the ones we wish to separate.

In designing such a box we will have one dimension fixed by the place it must occupy in the plant. This is usually the depth, which must not use up too much head room. It will probably be convenient to assume another dimension, such as the width. Occasionally the length has to be assumed on account of plant conditions, but usually the width may be taken and this makes the calculation a little easier.

We will suppose that this settler is to go in a sand and gravel plant producing 1000 tons of material per day of 10 hr. Of this 40% will be gravel and 60% sand. It is assumed that enough water will be used so that there will be five times as much water as sand going into the settler. It will also be assumed that there is 15% their weight of clay to be washed from the sand and the gravel, and that all the clay and water used in washing the gravel goes to the settler. The weights then will be, per day:

Gravel, 40%	400 tons
Sand, 60%	600 tons
Clay (15% of 1000)	150 tons
Total solids	1150 tons

Water (taken at five times sand), 3000 tons.

(No account will be taken of the water going to the bins with the gravel.)

The weights going to the settler will be:

Sand	600 tons
Clay	150 tons
Solids	750 tons

With 3000 tons of water, this makes a pulp of 20% solids. As we are to make a correction for the specific gravity of the pulp, we may find the specific gravity from the percentage of solids, either by consulting a table or figuring it from the formula:

$$\rho = \frac{100\,s\,(a-1)}{a\,(s-1)}$$

in which ρ is the percentage of solids, a the specific gravity of the pulp and s the specific gravity of the mineral, taken as 2.65. Substituting, we have

$$20 = \frac{265\,(a-1)}{a\,(2.65-1)}, \text{ or } 20 \times 1.65a = 265a - 265$$

Solving this, we find that $a = 1.14$.

It is supposed that by studying the screen analysis of the sand we have found that we can get a good concrete sand by taking out all the 100-mesh grains and some of the 65-mesh grains. In other words, we want to make a split on 65-mesh.

We will start with assuming that we want the box 8 ft. wide. The depth may be anything so long as it provides sufficient space for the settled sand. Six feet is a good depth to use where the headroom will allow it. The depth should not be less than 4 ft.

The steps in figuring the length are:

Water Flow. This is taken at 3000 tons per day, or 5 tons per minute, which is 160 cu. ft. per minute, as 32 cu. ft. of water equals 1 ton. But as we want the flow in second-feet we divide this by 60 and have 2.67 cu. ft. per second as the flow.

Head Over Weir. The next step is to find the head over the weir at the end of the box. We have assumed the width to be 8 ft., so the flow per foot of width is $2.67 \div 8 = 0.334$ cu. ft.

The head over the weir may be found in almost any engineer's pocketbook. Taking the figures given in Marks' Mechanical Engineers Handbook (page 264) we find the head over the weir corresponding to a flow of 0.334 cu. ft. per foot of weir is 0.216 ft.*

Velocity. The cross section of the stream carrying the grains we find to be 8 ft. (the width of the box) times 0.216 ft. (the depth over the weir) which equals 1.728 sq. ft. The velocity of flow is equal to the number of cubic feet in the flow divided by the area of the cross section expressed in square feet. This is $2.67 \div 1.728 = 1.55$. The velocity then is 1.55 ft. per second.

Time to Fall Out of Stream. It would seem that, as the stream is only .216 ft. (about 2½-in.) thick, the grain would have to fall only this distance to be safe in the still water below. But we know the current affects the still water under it for a short distance. This distance varies with the velocity. On such work as this we may assume that the disturbance does not extend very far down, and that the grain will be caught if it falls 6 in.†

Now we need to know the time required for a 65-mesh grain to fall 6-in. and we can get this most easily from Prince's figures. These show (Table II, column 3) that the time required by a 65-mesh grain to fall 1 ft. is 8.80 sec. To fall 6 in. would therefore require 4.40 sec.

Length of the Box. Having the velocity and the time the grain must stay in the box, it is a simple matter to figure the length required. We must find how long it should be to allow a grain moving with a current velocity of 1.55 ft. per second to remain in the box 4.40 sec., and the answer is $4.40 \times 1.55 = 6.8$ ft.

Corrections. We have taken into account only two factors, the fall of the grain and the velocity due to the quantity of water admitted to the box. But there are other factors that will affect the result. The first of these is the velocity the stream already has when it enters the box. This may be anything, depending on the head and the way it is admitted to the box. Fortunately it can be controlled if it is too fast by various "stilling" devices that will be explained later. Let us assume for simplicity's sake that the stream will enter the settling box with a flow of 1 ft. per second.

*The effect of the velocity of approach on the head over the weir may be disregarded.

†As a matter of fact the disturbance must extend much deeper than 6 in. But the writer's experience in figuring boxes of this kind is that 6 in. works out well for a safe fall on grains as coarse as 65-mesh.

Since the grain is to remain 4.40 sec. in the box, we must make the box 4.40 ft. longer on account of this velocity.

A second correction must be made for specific gravity. This is not so important in surface current settling boxes (the type to which this box belongs) as it is in rising current devices, which are to be explained later. The reason is that all the heavy grains have fallen out of the stream before the grains which are to be discarded reach the overflow. Again, for simplicity's sake, we will assume that the specific gravity affects the fall of the grain only half the time (the first half) that it is in the box.

Recalling what was said about the influence of the specific gravity of the pulp on the falling rate in Part I of this series, it will be remembered that the velocity of fall is affected as $(\delta - 1) \div (\delta - a)$ where δ is the specific gravity of the grain (2.65 in this case) and a is the specific gravity of the pulp, which we have just found to be 1.14. We have then $2.65 - 1 \div 2.65 - 1.14 = 1.06$ which means we must multiply the length (or half of it in this case) by 1.06, or add 0.06 to half its length

The corrected length then is:

For velocity due to volume.....	6.8 ft.	
For velocity at entrance.....	4.4 ft.	(11.2)
½ of 11.2 × .06.....	.34 ft.	
	11.54 ft.	

This is equal to 11 ft. 6½ in.

Margin of Safety. After a settling box has been figured in this way it is always advisable to build it with a margin of safety, adding a little more length. A partition can be put in at the point which would make it the length required by calculation and this partition may be moved until the best results are secured. The space between the partition and the overflow soon fills up with sand and everything flows out over the overflow that is intended to go out.

Lengthwise Partitions

Lengthwise partitions may also be used to correct or change the classification. Their effect is to narrow up the current, and they need not extend to more than a short distance below the surface to do this.

Their effect may be calculated, but it is much simpler to put in such partitions and try them in various places until the sand in the overflow is the size wanted there. A rough cut-and-try method can sometimes be used to find the first position for the partitions.

Let us suppose that we have built the box 11 ft. 6 in. long (not including the 2 ft. partitioned off as a margin of safety). We wish to know what will be the effect of putting in two longitudinal partitions to reduce the width to 6 ft.

Finding the head over the weir for a 6-ft. box as we did for an 8-ft. box, we learn that it is 0.26 ft. Our current cross section is therefore $.26 \times 6 = 1.56$ sq. ft. Dividing the number of cubic feet per second (2.67) by 1.56 we have 1.71 as the velocity in feet per second.

We assumed an entrance velocity of 1 ft. per second for the 8-ft. box. This will be increased, by decreasnig the width of the box, to 8/6 of this velocity, or 1.33 ft. per second. The velocity of the current will therefore be $1.71 + 1.33$, or 3.04 ft. per second.

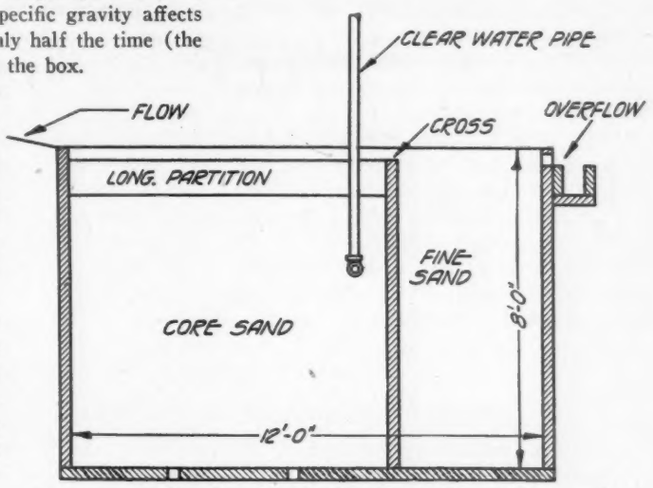


Fig. 11. Settling box having longitudinal partitions and a pipe for admitting clear water

Dividing the length of the box, 11.5 ft., by the velocity, 3.04 ft., we find that the grains going to the overflow will remain in the box 3.8 sec. This is the time the grain has in which to fall 6 in. in order to be saved in the box. Doubling this to find the time required to fall 1 ft., we have 7.6 sec. This corresponds to a falling rate of 1.56 in. per second, and if we plot that on the curve of falling rates (Prince) we find that it lies about halt way between 48 mesh and 65 mesh. The split then will come about half way between 65 mesh and 48 mesh and the sand will be coarser in proportion.

Boxes of the kind which have been calculated here are much used but seldom built except by guesswork. Usually they are built too large and often the builders do not know that the area may be reduced by putting in partitions. A few changes to boxes already in use would show a remarkable effect in the sand offered for sale in different localities.

A box of this kind which was figured to make a certain split, and which has now been in use for three years, was described in Rock Products, October 30, 1926. It is in use at the Forrestport plant of the Boonville Sand Co., Utica, N. Y. (See Fig. 11.)

It will be noted that a perforated pipe for the admission of a little clear water is placed at the overflow of this box. The clear

water admitted breaks up the eddy that forms at the overflow and keeps out unwarranted fine grains.

The device described here is a plain box with straight sides and a flat bottom, but the settler may take a number of forms. A common one is the ordinary sand "tipple" built straight on one side and slanting on the other. These are generally very wide in proportion to the length, as they are used to store sand, as in a bin, as well as collect it. In calculating these it is well to build them with a little extra length for safety, even though the cost is more. On the other hand, it is well not to build too long, because this will leave dead spaces in which fine sand and clay will collect.

Very long and narrow boxes of this type are used in the sand and gravel district near Oxford, Mich., as sand settlers. They are given a great length because of the high velocity the water has when it enters the box, and they are set at a considerable slope which increases the velocity. These boxes are called sand flumes.

(To be continued)

Determining Free-Water Content of Field Aggregates

A DIRECT method for determining the total quantity of free water in field aggregates for concrete is described by R. P. V. Marquardsen, assistant engineer for the Chicago terminal improvement of the Illinois Central railroad in a recent issue of *Water Works*. In Mr. Marquardsen's method the required results are given immediately and can be read directly from the scale on the apparatus. In making this test it is not necessary to dry the aggregates, which is the chief objection to the usual method. It is claimed that if the test is carried out carefully, and if the aggregate is fairly uniform, the error in amount of free water contained will not exceed 1%.

The apparatus consists of three main parts: the container, *A;* the plunger, *B,* and the adjuster, *C*. In the figure shown, the dimensions are given for apparatus to test a 5 lb. sample. They can, of course, be varied to accommodate other amounts of the aggregate.

The scale shown on the adjuster is based on a specific gravity of 2.65 and unit weight of water equal to 62.5 lb. per cubic foot. For greater accuracy, in using specific gravities other than 2.65, new scales can be added to the adjuster, but the error is slight without this correction, being only 2% for 0.10 change in specific gravity.

The water in the glass tube rises with the increase of moisture content in the aggregate, and this rise may be expressed:

$$R = \frac{W\,(S-1')}{100\,V\,S\,A}$$

in which

R = rise in inches of water in tube for each 1% of moisture content.

W = total weight, in lb., of field-condition aggregate tested.

S = specific gravity of aggregate.

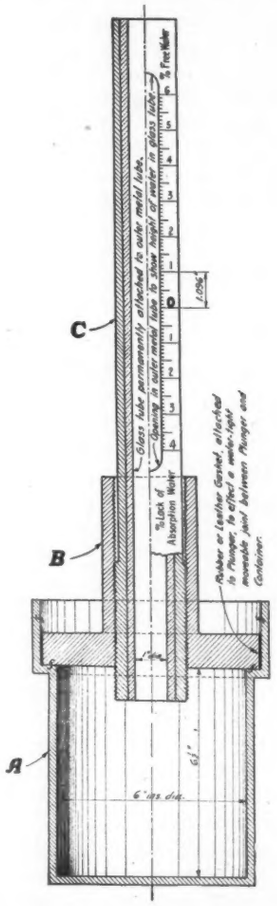
V = weight of water, lb. per cu. in.

A = area of opening in tube, sq. in.

Assuming the dimensions shown in the figure:

$$R = \frac{5\,(2.65-1)\times 1728}{100\times 62.5\times 2.65\times 0.7854} = 1.096''$$

When adjusting for tests of samples from a single source, about 6 lb. of the aggregate is submerged in water until all particles have absorbed to their full capacity. The aggregate is then dried with a towel or similar means until it holds no free water. Five pounds of this full-absorption aggregate together with 5 lb. of water are placed in the container, and the plunger is replaced so that it is firmly seated in the container. The adjuster is then turned until the water in the tube coincides with the zero mark on the scale, and the position of the adjuster marked with reference to the plunger. That position is the one to be used when tests of that particular aggregate are to be made at any time.


C
B
A
% Free Water
Glass tube permanently attached to outer metal tube.
Opening in outer metal tube to show height of water in glass tube.
% Lack of Absorption Water
Rubber or leather Gasket, attached to Plunger, to effect a water-tight movable joint between Plunger and Container.
6" dia.

Device for determining free-water content of aggregate

In making the test 5 lb. of the aggregate and 5 lb. of water are placed in the empty container. The plunger is replaced and firmly seated, and then the percentage of contained water is read on the scale. If the scale reads above zero, the field aggregate contains free water, but if the water does not rise to the zero point, the aggregate lacks water enough for full absorption.

It should be kept in mind that these tests are for field-condition aggregates. Thus if a test shows 2% of free water content, then in 100 lb. of the aggregate there would be 2 lb. of free water and 98 lb. of full absorption material, and if the test shows a lack of 2% for full absorption, then each 100 lb. of the aggregate actually represents 102 lb. of full absorption aggregates.

If it is desired to test a material of unknown specific gravity which is lighter or heavier than gravel or crushed stone, it is necessary to make a new scale. First determine the zero point for full absorption but no free water, as told above. Then proceed to find the point on the scale which indicates 5% of free water. This is done by using 4¾ lb. of water in the container, as this would be equal to 5 lb. of the field-condition aggregate (containing 5% of free water) and 5 lb. of water. When the zero point and the point of 5% free water have been determined, the scale is marked with five main divisions between the two points, each division indicating 1% of free water content, and from this scale the true reading for the free-water content of that particular material is determined.

Name for Phosphate Fertilizer Changed to "Superphosphate"

CONCURRING with the decision of the Association of Official Agricultural Chemists to change the term "acid phosphate" back to the original term "superphosphate," Secretary of Agriculture Jardine announced recently that all reference to this fertilizer in department publications and correspondence will hereafter be made through use of the term "superphosphate," with the old name carried in parentheses until the change is established. The statement follows in full text:

For many years the term "acid phosphate" has been applied to a fertilizing material which is neither acid in reaction nor does it impart an acid reaction to the soil on which it is used. Dr. Henry G. Knight, chief of the Bureau of Chemistry and Soils, says it is desirable, therefore, to get away from this misnomer which is responsible for the general impression among farmers that the continued use of this material will bring about an acid condition in their soils. This impression has resulted in considerable sales resistance which it is felt will be overcome by getting back to the original name, a name that is descriptive of the contents of the fertilizer, whereas the only excuse for the word "acid" is that sulphuric acid is used on phosphate rock to make the phosphorous available for plants, but the acid does not remain as such in the finished fertilizer.

Typical English Quarry Operation*

New Crushing Plant at the Waterlip Quarry, Cranmore, Has a Capacity of About 10,000 Tons Per Week

THE new crushing plant at the Waterlip quarry, Cranmore, England, owned and operated by the Roads Construction, Ltd., Bristol, was formally opened on September 29, 1927. Over 500 highway engineers and others attended the opening and after inspecting the new plant witnessed a special blast which dislodged about 15,000 tons of stone, a charge of about 2100 lb. of explosive being used. Following the blast, the party adjourned to a luncheon at which Sir Henry Maybury, president of the Institution of Quarry Managers, was the guest of honor.

The new crushing plant was built at an estimated cost of about $500,000 and contains many of the latest features of English equipment and design. Its capacity is about 5,000 tons per week for a single shift and 10,000 tons when a double shift is worked.

Primary Crushing Plant

At the quarry, power shovels load the rock into 15-ton quarry cars and these are then run to the primary crushing plant building electrically by the plant operator, and stopped on an end-tipping table which is raised by means of a 35-ton overhead electric traveling crane. The rock discharges through the end door in the wagon into the crusher feed chute. The crusher is of the jaw type 60 in. x 42 in. jaw opening. The total weight of this machine is 130 tons, the swing jaw weighing 23 tons, and each half of the main frame 33 tons. The main and pitman bearings are water cooled. The crusher runs at 110 r.p.m. and is driven by a 200 hp. slip ring motor housed in a dust proof chamber, by a belt 24 in. wide. The rock is reduced to 7-in. down, and discharges into a balancing hopper under the crusher from which it is drawn off by means of a mechanical feeder into the 30-in. main conveyor.

Secondary Crushing

The main conveyor from the primary plant enters what is termed the secondary plant and discharges into the first scalping screen. This screen is 60 in. in diameter, and 23 ft. long, and it is fitted with a single screen jacket. The over 4-in. material discharges into the secondary crusher, the 4-in. to ¾-in. discharges into the secondary elevator, the ¾-in. down is rejected as dirt. The secondary elevator discharges into the second scalping screen which is similar to the first but with different perforations, the over 3-in. discharges into the tertiary crusher, the 3-in. discharges into the 18-in. belt bucket elevator which in turn discharges it into the 25-ton steel storage bin outside the building. When there is a reduced demand for 3-in. it is by-passed into the tertiary crusher. The 2½-in. down discharges into the main elevator for elevating to the main screen house. The product from the tertiary crusher discharges into the secondary elevator for re-screening.

The secondary crusher is of the gyratory type with a 16-in. opening and is direct driven by a 100-hp. motor running at 363 r.p.m.

The tertiary crusher is of the same type with a 10-in. opening and direct driven by a 50-hp. motor at 413 r.p.m.

The screens, elevator and main conveyor are driven by a 100-hp. motor on a platform at the other end of the building.

Main Screen House and Bins

The main elevator from the secondary building is 30 in. wide and 84-ft. centers and enters this building on the high level. The grading screens and storage bins are in duplicate, one side for clean stone and the other for hot dry stone for asphaltic tar macadam aggregate. The discharge from the main elevator is split into the two circuits called the clean stone side and the hot stone side. The rejection system of screening is adapted for the first four sizes and the four stream screen (Pool's patent) system for the remaining four sizes.

In the first grading screen the 2½-in. and 2-in. are rejected and discharged into their respective storage bins, the 1½-in. down is collected and discharged onto an 18-in. belt conveyor which in turn discharges it into the second grading screen. The 1½-in. and 1-in. are rejected and discharged direct into their respective bins. The ¾-in. down discharges onto a short 16-in. belt conveyor which in turn discharges into the four stream screens which separate out the last four sizes. When it is desired to re-crush any particular size it is by-passed into the central re-crushing conveyor. The total bin capacity is 2,500 tons. The first and second grading screens are 48 in. in diameter x 22 ft. long.

On the hot or dry stone side, the stone, instead of passing direct into the grading screens, is discharged into a vertical static stone dryer. From the base of this it is automatically drawn off and

General view of the quarry, showing the power house and repair shop on the left, control tower in the center and the primary crusher house on the right

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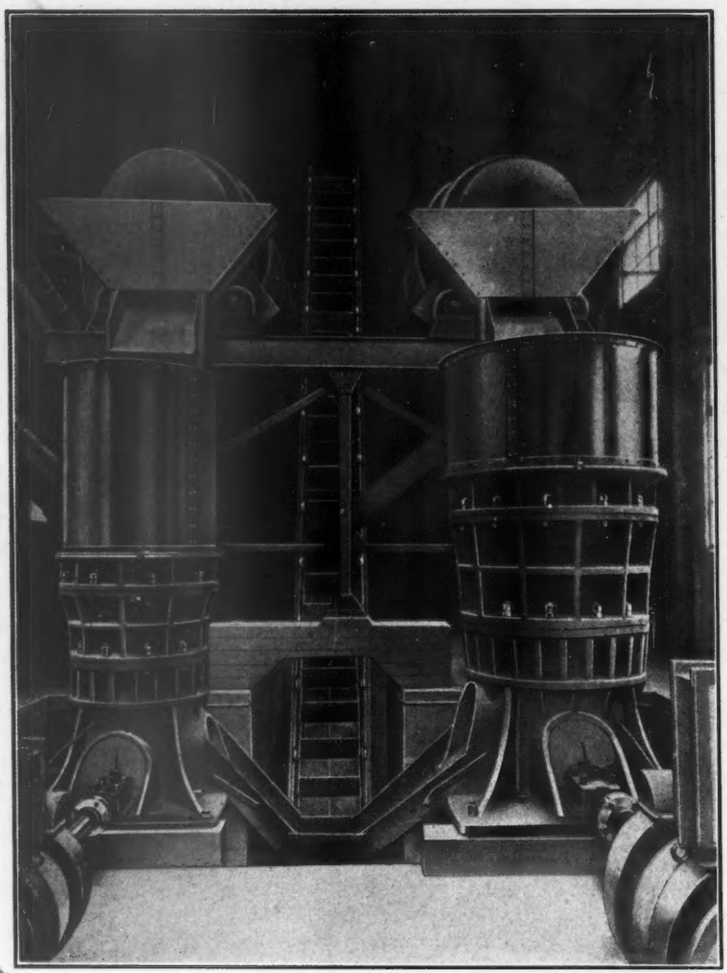
discharges into the hot stone elevator which in turn discharges into a grading screen. The company has found by experience and experimental work that to obtain the best results in asphaltic tarmacadam manufacture, a period must elapse between the drying and mixing processes to permit of sweating, and they have made provision for this in the design of the mixing plant.

Dryer and Tar Tanks

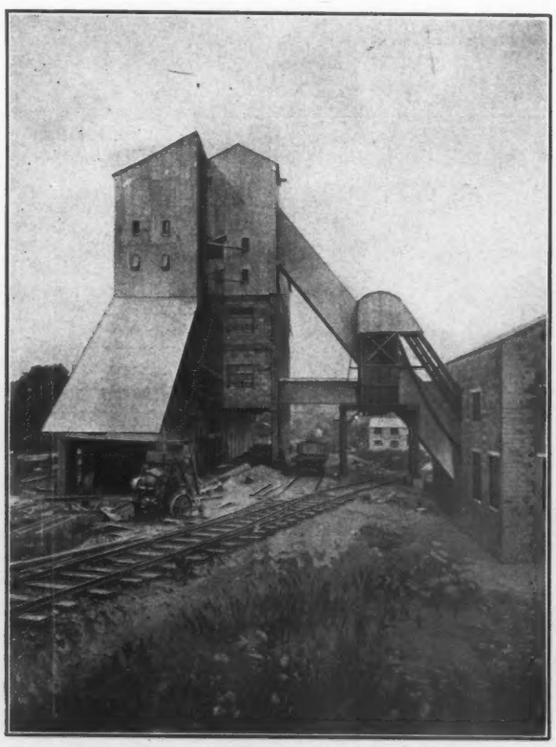
The dryer, which receives half of the flow from the main elevator, is of 60 tons per hour capacity, and is constructed on the static principal, i. e., there are no moving parts except the automatic feeders at the top and base. The stone passes slowly down through an annular space between plates perforated in a special way and meanwhile hot gases are forced through the bed of stone into the center and are exhausted by the large vertical spindle fan on top. It is claimed that in this method of drying the sharp edges of the stone are not taken off by abrasion, as the actual movement of stone is very slow, 30 tons being in the dryer at a time. The hot stone is drawn off by a plate feeder and discharges into the 24-in. hot stone elevator for elevation to the screens. Gases are supplied by an oil-fired furnace and enter at a temperature of 250 deg. C., and exhaust at 125 deg. C. There is a high pressure fan and also a low pressure fan for supplying the air for the furnace. The furnace oil is stored in the base of the dryer below the feeder, where there is capacity for 24 tons. All temperatures are checked by pyrometers and can be adjusted to suit the varying conditions.



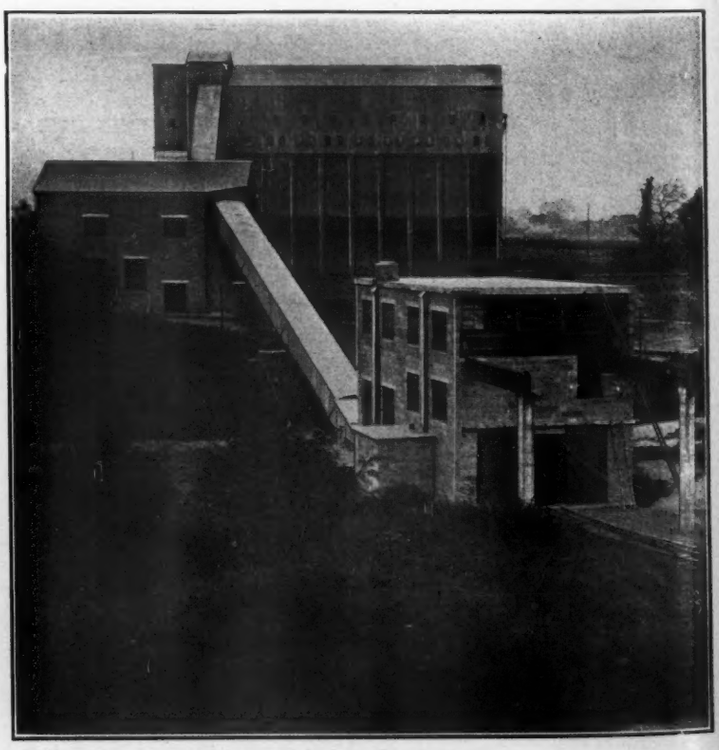
Secondary crusher and primary scalper at the right, secondary elevator in the center and tertiary crusher and secondary screen on the left

Close by are two tar storage tanks, each of 11,000 gal. capacity. They are constructed of reinforced concrete, and can be filled either from rail tanks or by road tanks by means of large pipes.

In the deep pit alongside will be situated a steam-heated tar heater, and a tar pump, which will maintain a constant circulation of hot tar through the tar plant to be drawn off as



Secondary crusher house on right and main elevator in center. Bins and screen house on left



General view of the crushing and screening plants and the concrete storage bins

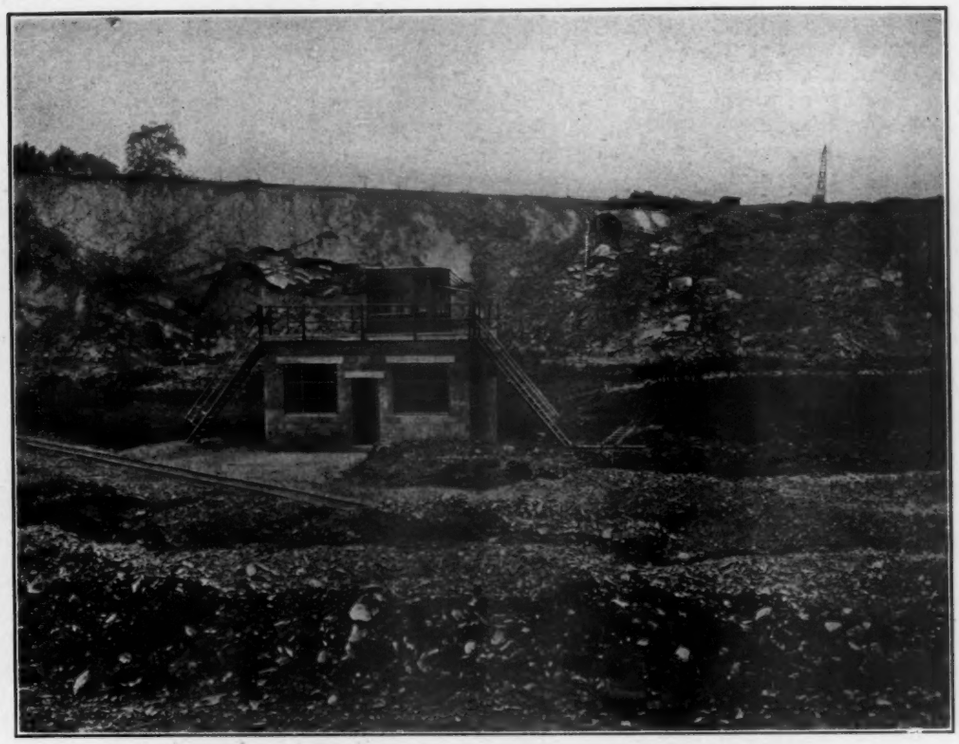
required.

Asphaltic Tarmacadam Plant

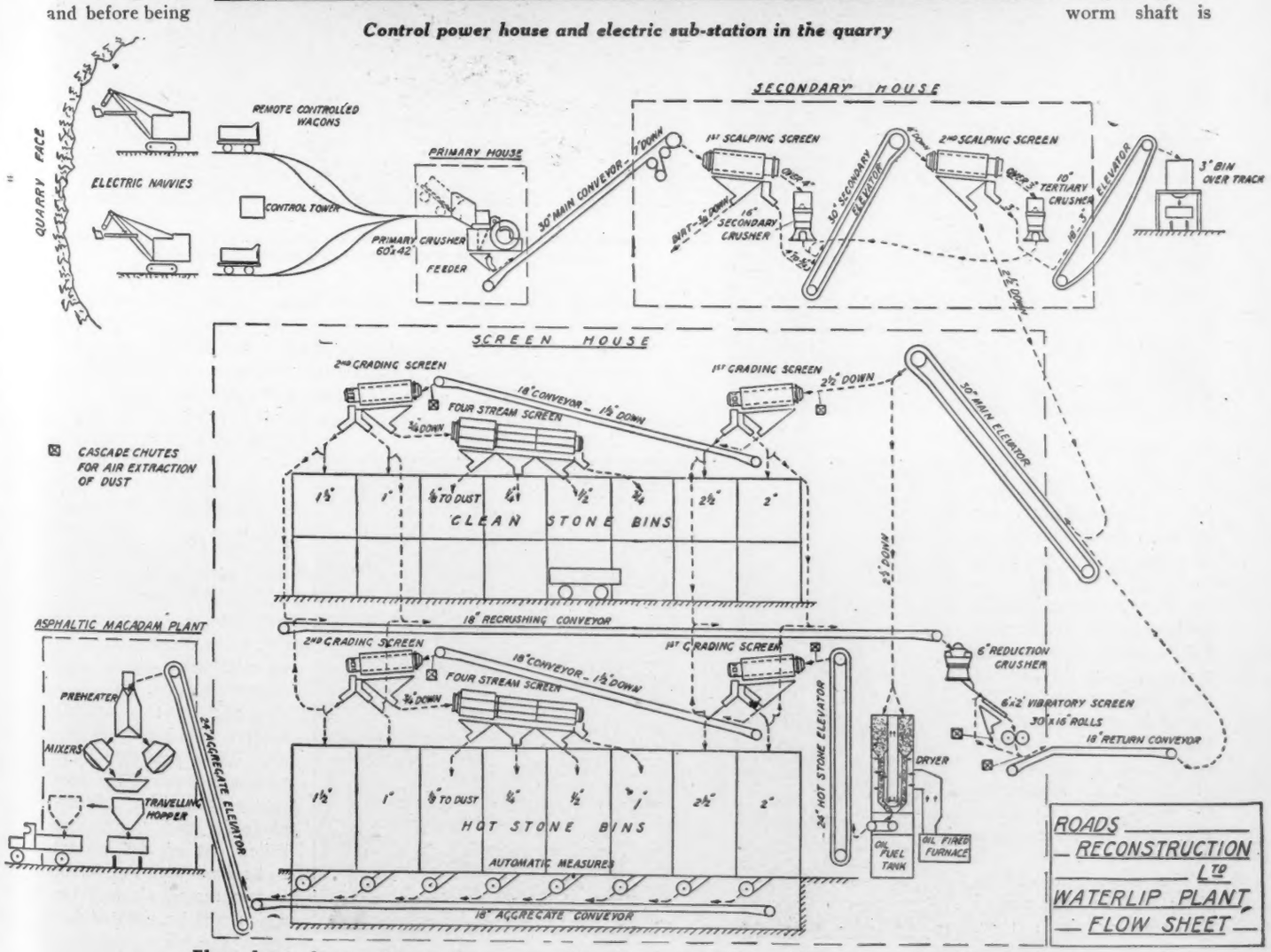
The tarmacadam plant has not yet been quite completed. Throughout this plant most elaborate methods have been adopted to ensure quality and uniformity of product.

The company has proved by experience that for most efficient drying of stone for tarmacadam, it is necessary to allow the stone to stand for a period after being dried and before being mixed, as, on emerging from any form of dryer the stone is invariably in a "sweaty" condition which passes off in a few minutes. Hence the practice adopted of drying before screening.

The dried stone is drawn off from the deep bins by special electrically controlled feeders which have been designed to measure off accurately and consistently the correct proportion of various sizes in different gradings. A worm shaft is

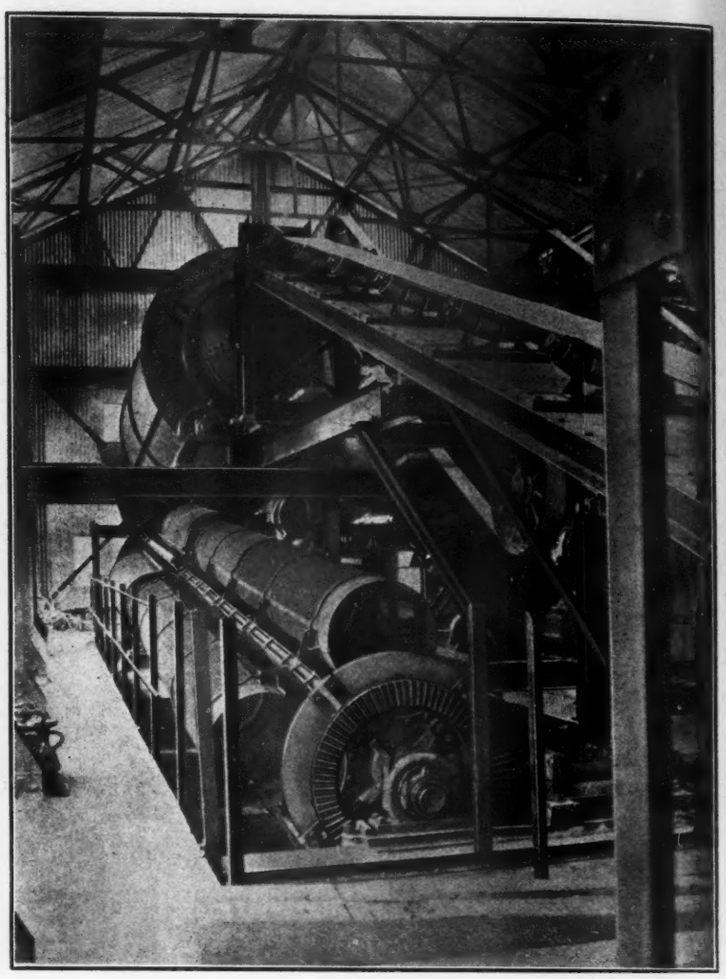


Control power house and electric sub-station in the quarry

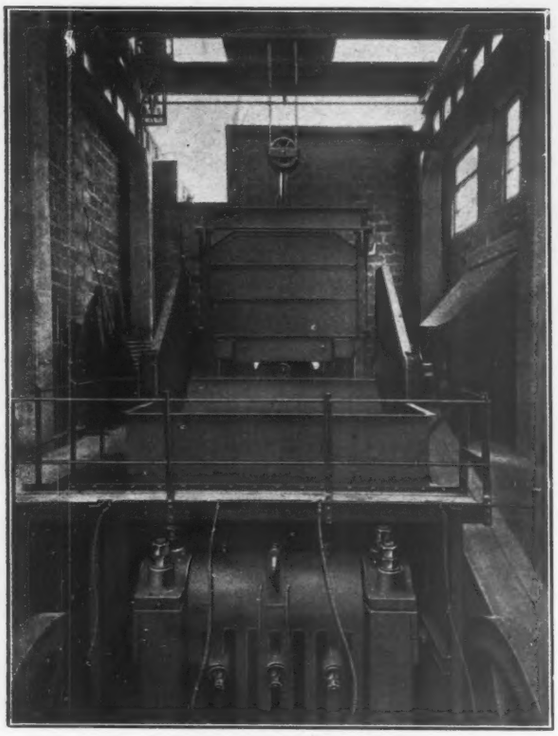


Flow sheet of operation at the new crushing plant at the Waterlip quarry, Cranmore, England

constantly rotating at a definite speed and the feeder itself is put into gear by a solenoid and clutch. The solenoids are all controlled by the master controller, which by means of cam operated switches, energizes any required combination of solenoids for definite periods, and the particular feeders concerned thus do a definite number of revolutions in that period. The controller is started by a push button switch by the attendant, does one revolution and then stops. During this revolution all the operations take place and the total batch of stone is delivered on to an 18-in. conveyor running in a tunnel under the bins. By simply changing the cam shaft, any number of gradings may be obtained.



Interior of primary crusher house, showing at the back the 15-ton end-tip electric quarry car

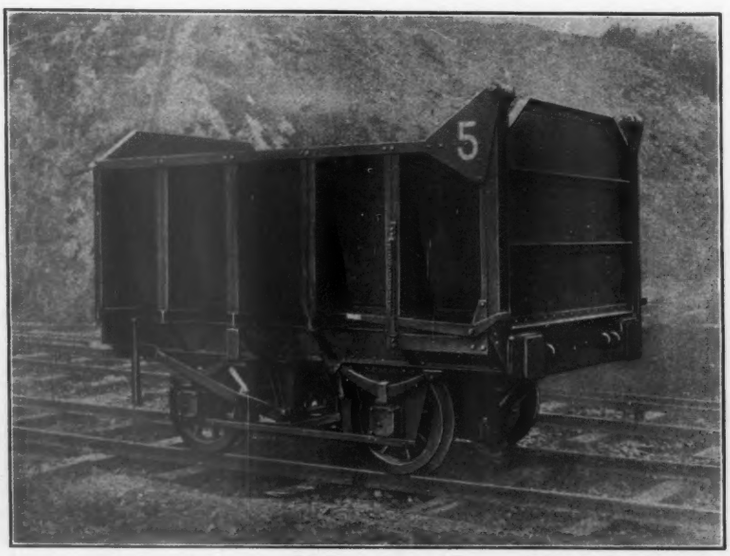


Screening plant showing the secondary grading screen and the four-stream screen for sizing material from 3/4-in. down

The conveyor discharges into a 24-in. elevator for elevation to the tar plant. In order to bring the stone up to the required temperature before mixing a dual preheater will be provided, divided into two sections, one discharging into each mixer. This heater is supplied with hot gases from the oil fired furnace at a temperature of 250 deg. C. The elevator discharges into alternate sides by means of a flap-over chute.

The mixers, of which there will be two, are of the rotating drum type, which have been specially designed to ensure thorough mixing. They have a batch capacity of one ton.

There will be a constant circulation of hot tar at about 200 deg. F. maintained by the tar-pump in the pit beside the tanks, and this will be passing through a special valve which in the "down" position passes the tar through a measure, keeping it filled. When the valve is released it cuts off the main supply from the measure by passing it to the tar return and meanwhile the tar drains off from the measure to a level which can be adjusted by the inclination of the drain pipe. This ensures correct quantities of tar. The measure and valve are mounted on a platform above the mixer platform, and here also will be two asphalt heaters of 15 cwt. capacity. When asphaltic mixtures are required the necessary quantities of asphalt for each batch are bailed out of the heaters and mixed with the tar in a compressed air agitator which will be situated below the valve and receive the tar from the latter.



One of the all-steel, 15-ton end-dump remote controlled quarry cars

From the agitator the mixture is blown into the mixer by compressed air in the form of a spray which assists the coating of material. Fillers of various types as required may also be blown in.

When mixing is complete, the mixers revolve on a horizontal axis and discharge into railway trucks below or into a 6-ton travelling hopper which will run out over lorries in this area, so that the lorries do not interfere with truck movements, and also may be quickly loaded.

The capacity of the plant is about 2,500 tons per week, which may be increased if necessary by double-shifting.

Re-crushing Unit

At the top of the screen house it will be remembered how it was possible to divert the larger sizes from the screens on to the central re-crushing conveyor when the demand for the larger sizes decreases and that for the smaller sizes increases.

Owing to the large reduction that may be required it has been necessary to provide two crushers in series, a gyratory and a set of rolls in the deck below.

The conveyor discharges into the reduction gyratory which has a 6-in. opening and is direct driven by a 50 hp. motor at 600 r.p.m.

Normally the stone passes through the gyratory and over the vibrating screen into the rolls beneath, the screen relieving the rolls of stone ⅝-in. and down. It vibrates at 1,700 strokes per minute.

However, by diverting the flow of stone straight on to a conveyor below, by means of a flap-chute, the gyratory may be used by itself and the screen and rolls cut out of the circuit.

The rolls are 30-in. diameter x 16-in. face. They are driven through belts and a chain gear by a 20 hp. motor, and the oversize from the screen is fed into them by a chute, the through material taken to the conveyor by one chute, and the diverted material by another.

The conveyor is 18-in. wide and returns the stone into the 30-in main elevator in the secondary house.

Analyses of Indiana Coals

THE Bureau of Mines, Department of Commerce, has recently issued Technical Paper 417, Analyses of Indiana Coal. The paper gives a brief description of the geologic structure of the coal fields of Indiana, typical mining conditions in the different districts, and mentions the uses and markets for the coals.

The analyses furnished should be useful to rock products operators at or near the Indiana coal fields, inasmuch as they may reveal a source of suitable coal nearer their respective operations, with a consequent saving in freight rates. Copies of the paper are available from the U. S. Government Printing Office at 10 cents each.

New office building of the Loomis Talc Corp. in which many uses for talc are found

Many Uses for Talc Found in New Office Building of Loomis Talc Corp.

UNIQUE in its use of talc in a number of different ways is the new office building of the W. H. Loomis Talc Corp. at Gouverneur, N. Y. The building is of Spanish architecture with Ionic columns at the front, and is 60x28 ft. in size. The side walls are constructed of tile and stuccoed with a mixture of talc and white cement. The woodwork used in finishing the interior has an undercoating of talc and oil, over which is used a paint, with more talc as a base. The walls and ceilings are all of talc, the borders of the floors being of talc and concrete.

In the foundation walls of the building a new product of the company, called "Loomite," is used. It is claimed that the material is thoroughly waterproof. The chimney at one end of the building is built entirely of crude talc as are also the retaining walls at the east and west sides of the property. The cornices, window sills and copings are all constructed of talc, and the walls of the basement are covered with a mixture of talc and water.

The plans for the building were furnished by Lansing and Green of Watertown, N. Y., and the construction was in charge of Bert Bloss as foreman.

An interesting feature of the new building is the modern research laboratory located in the basement. The main floor of the building contains the company's general offices, while the engineer's office is on the second floor.

The Loomis company is now operating two plants, one built in 1919 and another in 1922. The second plant is said to be the largest talc mill in the world, and at present the company is installing additional machinery in this plant to raise the output to an even higher point. The new machinery is expected to increase the company's output by 5000 tons annually.

The Loomis company has acquired considerable additional property in recent years so that the company now controls about five miles of property on each side of the Oswegatchie river. There is a 47-ft. drop in the stream on the company's property, and it is contemplated to develop this for water power. There is a potential storage of 386,000,000 cu. ft. of water on the property. The holdings, which cover about 3000 acres, are all heavily wooded so that the company is amply provided with wood and power.

Caustic Value of Lime

TWO tentative methods for the determination of the causticity of burnt and hydrated lime as given in the A. O. A. C. methods are discussed and compared with one other in a recent article in *Industrial and Engineering Chemistry*. The modified Scaife method, widely used and accurate for the clear solutions from high calcium limes, is not accurate for the suspensions characteristic of high-magnesia limes. In the course of collaborative work between the University of Tennessee Agricultural Experiment Station and the National Lime Association, a device and technic were developed to insure the rapid and accurate determinations of $CaO{\cdot}Ca(OH)_2$ value of any calcined commercial product with minimum exposure to CO_2 and negligible interference from impurities. A different filtration apparatus evolved by the National Lime Association is also described and compared.

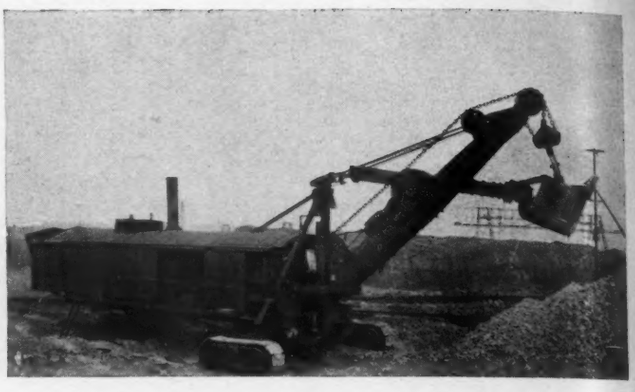
The advantages of the modified filtration procedure on the Scaife method are given as follows:

(1) It is simpler and more expeditious.

(2) It is adapted to all forms of lime, eliminates delay incident to settling, insures a sharp end point, and affords replication aliquots.

(3) It requires only one charge and one manipulation to obtain both pilot and determination aliquots, whereas the Scaife method requires two full manipulations.

One of the slag cooling pits of the France Slag Co.



Power shovel reclaiming cooled slag

New Slag Crushing and Screening Plant of the France Slag Company

Recently Completed South Chicago, Ill., Operation an Outstanding Example of Modern Construction and Design

By D. W. Yambert

Mechanical and Electrical Engineer, France Slag Co.

THE France Slag Co. of Toledo, Ohio, has recently completed a 120-ton per hour capacity slag plant in the Federal Furnace yards, 108th street and Calumet River, South Chicago, Ill. In the design of this plant much thought was given and effort put forth to make it a most modern, efficiently operated, fire-safe and accident-safe plant.

A few of the outstanding modern features which the plant possesses are as follows:

Steel and concrete fireproof construction throughout.

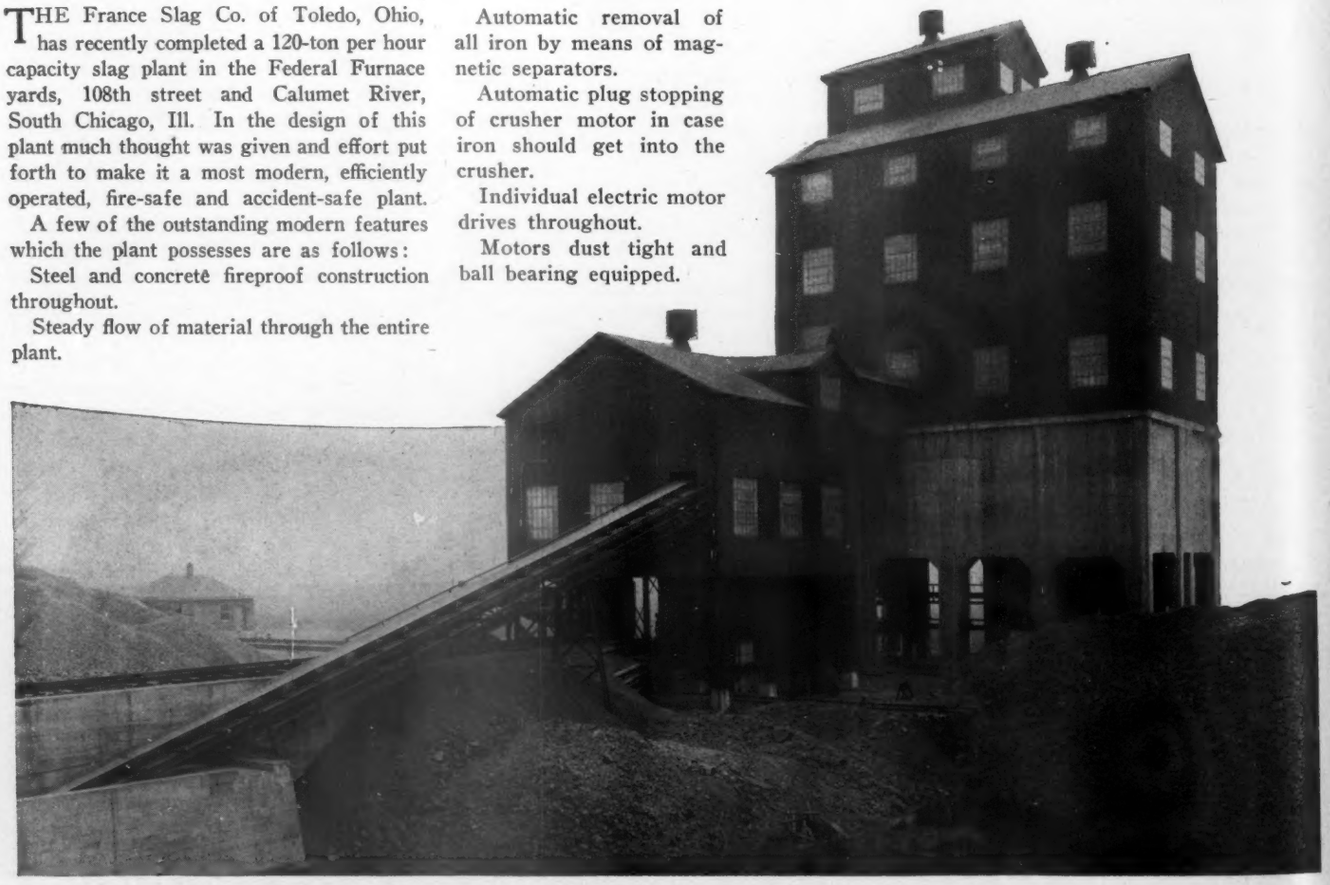
Steady flow of material through the entire plant.

Automatic removal of all iron by means of magnetic separators.

Automatic plug stopping of crusher motor in case iron should get into the crusher.

Individual electric motor drives throughout.

Motors dust tight and ball bearing equipped.



The France Slag Co. plant at South Chicago, Ill., one of the largest and most modern slag crushing and screening plants in the country

View of plant with storage piles at right, and office in front

Track hopper and inclined belt conveyor to the crushing plant

Motor starters of the totally enclosed magnetic contactor type.

Motor starters electrically interlocked for starting in proper sequence.

Oil and dust tight speed reducers on all drives except the crusher which is Texrope driven.

Standardization of equipment applied to screens, motors and speed reducers.

All chutes of steel and designed rather than "Cut and Fit."

Bins designed to load any size on either of two tracks.

Automatic removal of spalls, and undersize during loading from bins.

Automatic return to plant of spalls and undersize so removed.

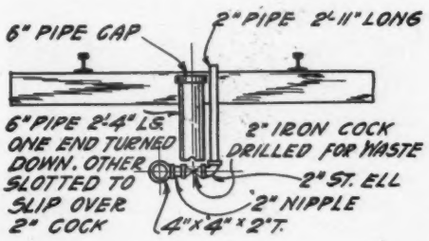
Arrangement for returning rejected material to the plant for re-screening.

Magnetic brakes used on elevators rather than elevator back-stops.

Electric sirens used for plant signals.

Flow of Material

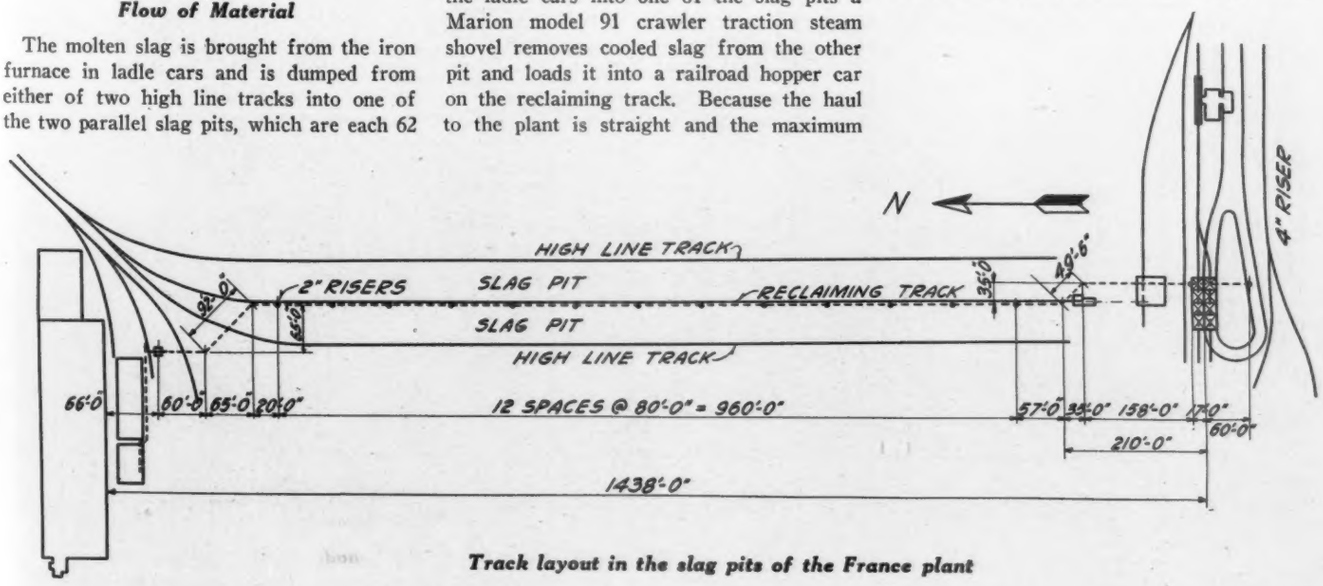
The molten slag is brought from the iron furnace in ladle cars and is dumped from either of two high line tracks into one of the two parallel slag pits, which are each 62 ft. wide by 900 ft. long. Between the two pits there is a practically level reclaiming track which leads directly to the crusher plant. Buried below the frost line under this reclaiming track is a treated water pipe line equipped with occasional taps for conveniently supplying boiler water to the steam shovel in the slag pits.


6" PIPE CAP
2" PIPE 2'-11" LONG
6" PIPE 2'-4" LG. ONE END TURNED DOWN. OTHER SLOTTED TO SLIP OVER 2" COCK
2" IRON COCK DRILLED FOR WASTE
2" ST. ELL
2" NIPPLE
4"x4"x2"T.

Detail of water connection for steam shovel supply

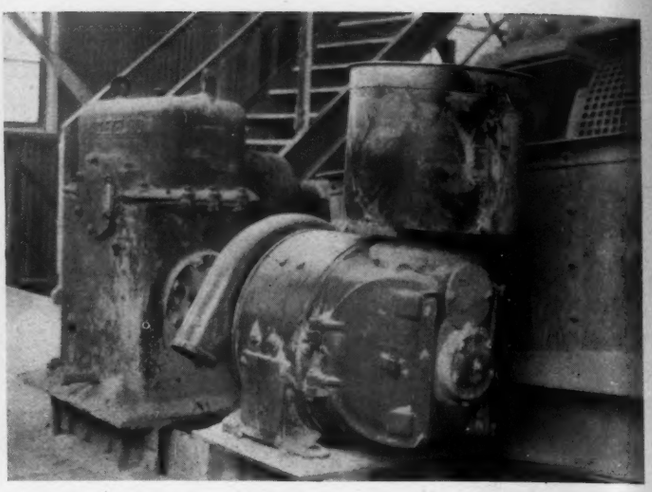
While molten slag is being poured from the ladle cars into one of the slag pits a Marion model 91 crawler traction steam shovel removes cooled slag from the other pit and loads it into a railroad hopper car on the reclaiming track. Because the haul to the plant is straight and the maximum length only 900 ft., the railroad hopper car is brought to the foot of the incline by a cable car-puller instead of by a locomotive. The car is dumped into a 50-ton capacity track hopper, the top of which is fitted with a welded structural steel grating with 15-in. square openings. Any material remaining on top of the grating is too large to be handled by the plant equipment and is swung aside by means of a small stiff-leg crane. The amount of such material at this particular plant, however, is almost negligible.

Beneath the track hopper there is a large reciprocating plate feeder which feeds and regulates the material to a 36-in. troughing belt conveyor, on 114-ft. centers, which elevates the material to a point somewhat above the crusher. The head pulley of the conveyor is a 36 in. x 38 in. Dings magnetic separator pulley which removes large pieces of iron before the material gets to the crusher and thus protects the crusher. The



Track layout in the slag pits of the France plant

The 36 in. x 38 in. magnetic pulley above the crusher



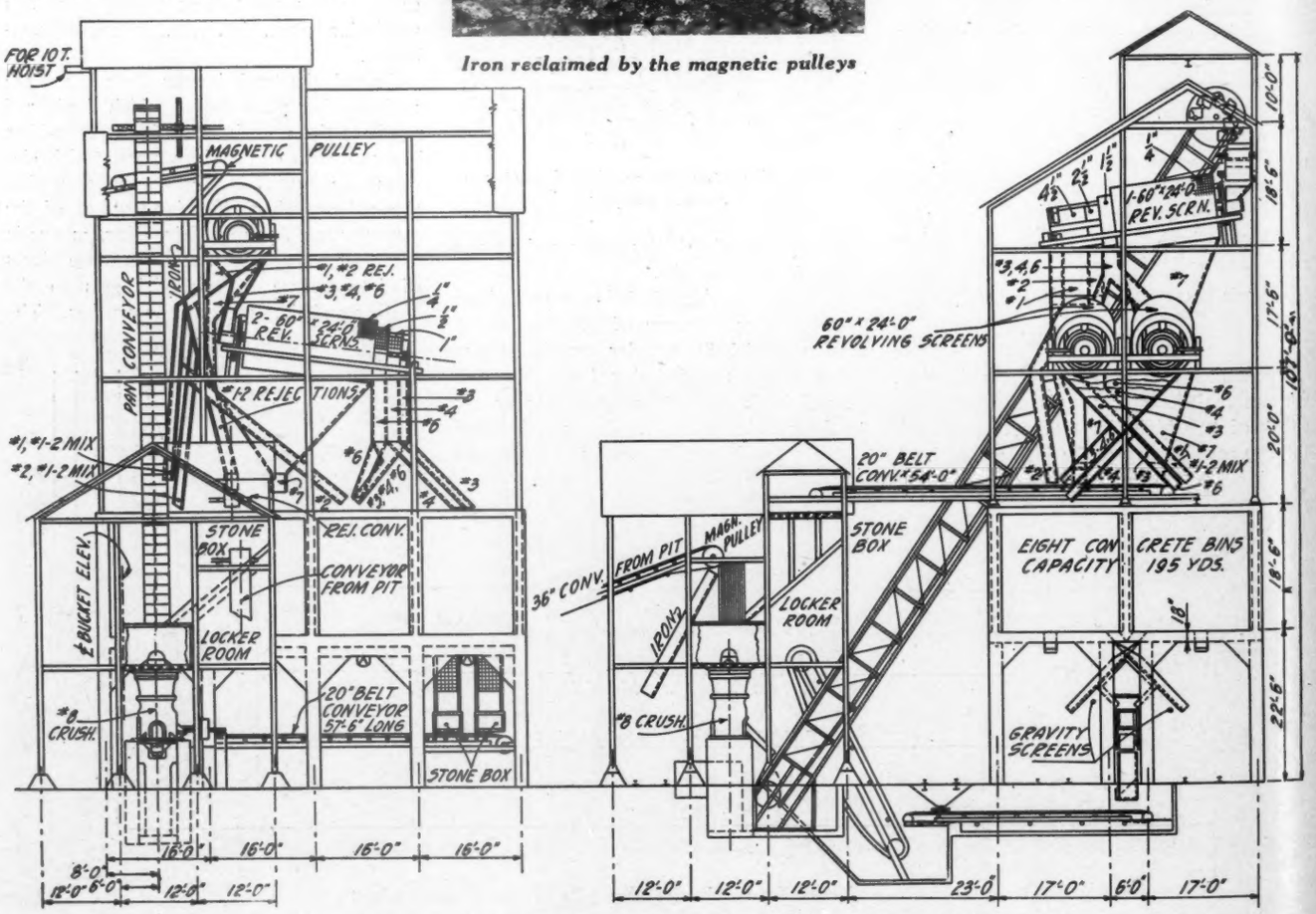
Electric motor for secondary screens, showing air filter

iron clings to the pulley and travels around with it until the belt, as it leaves the under side, forces the iron away from the pulley and out of the magnetic influence. The iron then drops into a chute which carries it to a small car provided for that purpose.

The pieces of slag that contain little or no iron are discharged from the belt conveyor on to a bar grizzly. The grizzly partially removes the finer material and permits it to by-pass the crusher, while the coarse material falls into a large stone box and rolls into the crusher.

Iron reclaimed by the magnetic pulleys

The discharge from the crusher and the material that bypasses the crusher are discharged into a 26 in. x 24 in. continuous bucket elevator and carried to the top of the screen house. This elevator discharges on to a short 48-in. wide belt conveyor, the head pulley of which is a 50-in. wide by 24-in. diameter Dings magnetic separator pulley. The purpose of this pulley is to remove any small pieces of iron which might have been liberated from the slag in the crushing. The iron so removed falls into a small bin for iron, located within one of the slag bins.



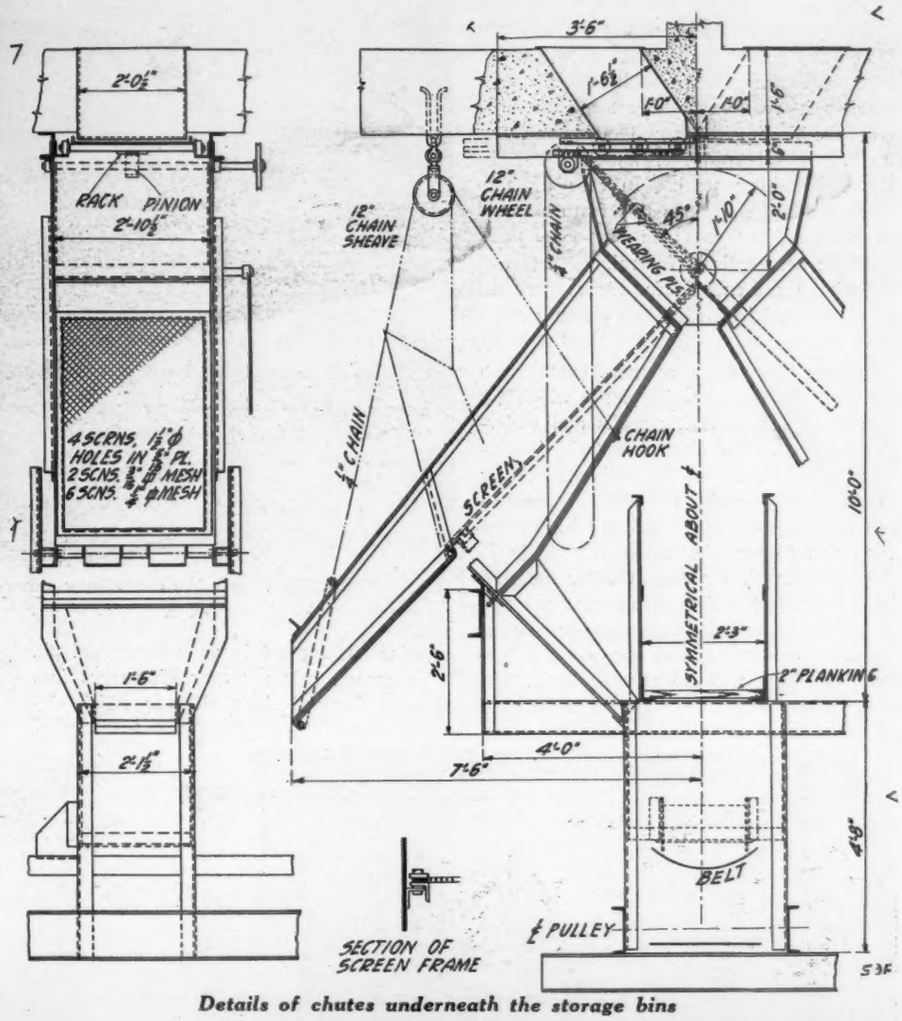
Cross section elevation of the crushing and screening plant

Detail of chutes and return conveyor under the bins

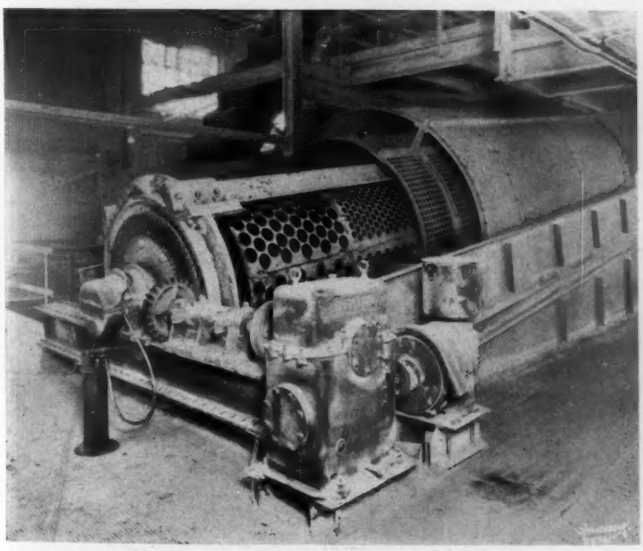
The short 48-in. conveyor discharges the slag into a 60 in. diameter by 24 ft. triple deck revolving screen which removes as much as possible of the 3/16 in. and smaller material, and cleans and separates a size from 2½ in. to 4½ in. and another size from 1¼ in. to 2½ in. Material over 4½ in. is discharged on to a 24-in. return belt conveyor and is carried back and fed again to the crusher. The two finished sizes and the material 3/16 in. and down go directly to the bins.

Material from 1¼ in. to 3/16 in. passes to the floor below the scalping screen and is divided equally between two 60 in. x 24 ft. triple deck revolving screens. These screens also remove as much as possible of any remaining 3/16 in. to dust material, and separate the slag in the following sizes: ¾ in. to 1¼ in., ½ in. to ¾ in. and 3/16 in. to ½ in. All of these sizes go directly to the bins. The chutes for all sizes are so arranged that any desired mixture of sizes can be obtained.

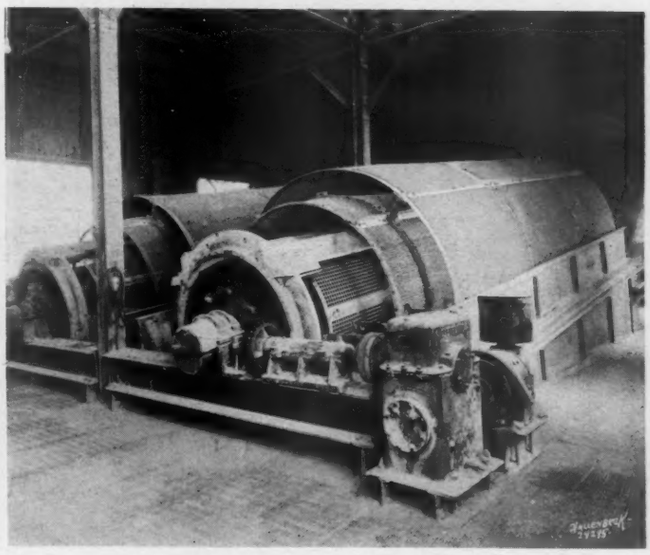
There are eight slag bins in two rows located over the two railroad tracks. All



Details of chutes underneath the storage bins



The triple-deck rotary scalping screen

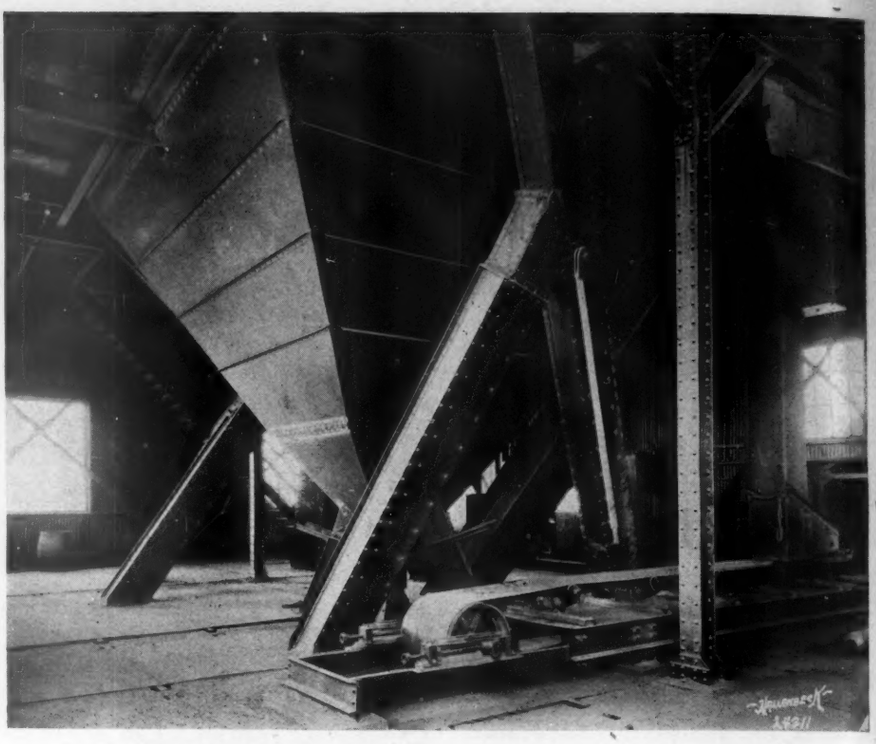


The two secondary screens showing the motor and drive

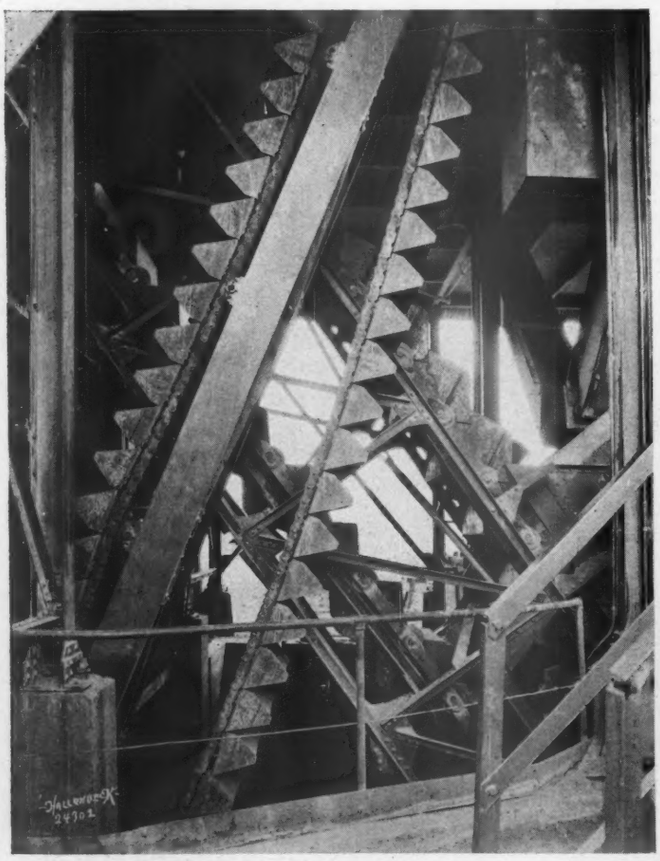
the bins except the dust bins and the iron bin have gates near the partition which divides the two rows of bins, so arranged that the gate of a bin in one of the rows and the gate of the adjacent bin in the opposite row will discharge into a common chute.

The gates beneath the bins are of the roller type operated by means of rack and pinion and pocket sheave with a hand chain. The chutes are provided with butterfly gates making it possible to direct the material from the bins in either row to a car on either track. In other words, all sizes can be loaded to either track. In case of both truck and rail shipments this feature would be quite advantageous in that one track could be used entirely for railway cars and the other track entirely for trucks, and still all sizes could be loaded into either cars or trucks.

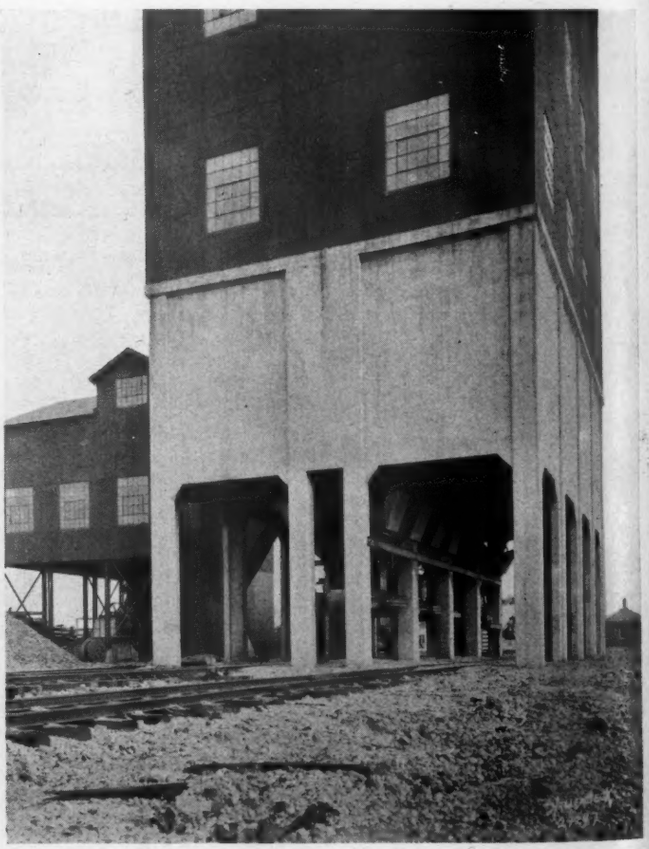
Leading from each common chute from the bins, there are gravity chutes which are perforated for removing spalls and undersize material. The cleaned material is conveyed from the end of the perforated chutes to the cars or trucks by means of counterbalanced hinged chutes which can be lowered for loading or can be raised so as to be in the clear for car movements under the bins. The spalls and undersize material are discharged on to a 24-in. belt conveyor running lengthwise of the rows of bins and this conveyor discharges on to another 24-in. belt conveyor running at right angles to the rows of bins and located in an underground pit. This second belt conveyor discharges into a small inclined chain elevator which elevates the spalls and undersize materials and discharges them into the 26 in. x 24 in. continuous bucket elevator, which in turn ele-



Chutes below the secondary screens. All chutes are of steel and specially designed



Large inclined bucket elevator from the crusher to the scalping screen behind smaller chain elevator



Concrete bins over the track, showing loading chutes for rail and truck shipments

vates them along with its regular load to the top of the screen house to be re-sized.

There is also a small track hopper and reciprocating plate feeder located just above the underground belt conveyor which is for returning rejected or dirty material to the screens for re-sizing. The rejected material goes from the plate feeder to the belt conveyor, is carried up by the small chain elevator to the 26 in. x 24 in. bucket elevator, and is discharged to the screens.

Description of Structure

The foundations for the plant are of concrete and reinforced concrete, on 35-ft. wood piling, and were put in place by Great Lakes Dredge and Dock Co. of Chicago. The Burrell Engineering & Construction Co. of Chicago designed and built the reinforced-concrete bins. The bin structure is 40 ft. by 64 ft., the bin depth being 20 ft. There are two rows of four equal sized bins each, with a small iron bin in the corner of one of these for the storage of iron removed by one of the magnetic separators. Sliding form (or slip-form) construction methods were used. The forms were set in place on top of the foundations and bulkheaded for the first-story columns. After the columns were poured the bulkheads were removed and the bin walls were gradually poured as the slip-forms were slowly elevated by means of jacks. This type of construction has given a concrete that is truly monolithic from bottom to top and the finished job presents a much neater surface appearance than stationary form concrete. Using a slip-form only 4 ft. in height facilitates better puddling and tamping, and helps eliminate the separation of aggregate from the cement and sand, thus resulting in a stronger and more uniform concrete throughout. Slag aggregate was used.

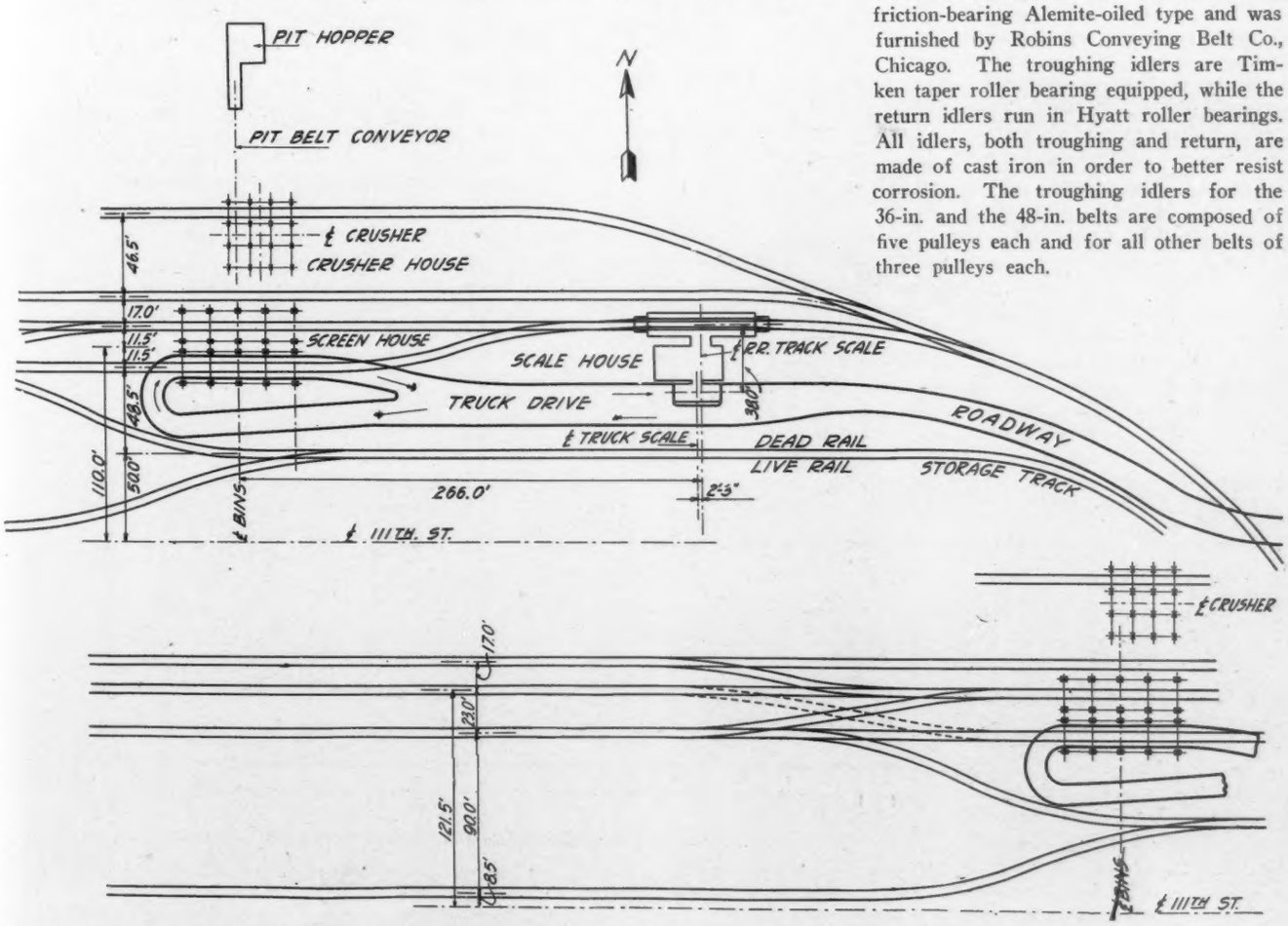
Electric siren used for signalling in the plant

The remainder of the plant structure is of structural steel and was fabricated and erected by Worden-Allen Co. of Chicago. That company is to be congratulated upon the satisfactory installation of the mixing chutes leading from the revolving screens to the bins. The detailing of these chutes was evidently a most difficult task and the designer who did the job deserves much credit. The steel design for the entire plant was most satisfactorily handled by K. Weinel of H. A. Brassert and Co., Chicago.

The siding, roofing and ventilators are of asbestos- and asphalt-protected metal furnished and installed by H. H. Robertson Co. of Pittsburgh and Chicago. This metal was selected because of its ability to withstand the corrosive gases and dilute acids to which it is subjected by reason of the plant location in the vicinity of blast furnaces; and, secondly, because it does not require painting from time to time, being practically maintenance-free. The metal comes to the site cut to size and shape, thus resulting in a quicker erection job.

Equipment Description

All belt conveyor machinery is of the anti-friction-bearing Alemite-oiled type and was furnished by Robins Conveying Belt Co., Chicago. The troughing idlers are Timken taper roller bearing equipped, while the return idlers run in Hyatt roller bearings. All idlers, both troughing and return, are made of cast iron in order to better resist corrosion. The troughing idlers for the 36-in. and the 48-in. belts are composed of five pulleys each and for all other belts of three pulleys each.



General track layout at the France Slag Co. plant

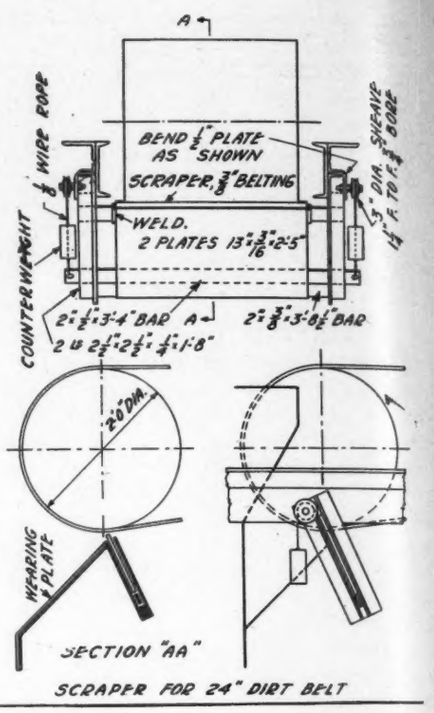
All head, tail, bend and take-up pulleys are rubber lagged in order to provide better friction and to minimize slippage and wear. Specially designed belt scrapers were installed on the under side of each conveyor head pulley in order to prevent the carrying back and depositing of fine particles of slag under the conveyor and for the full length of its run.

The two reciprocating plate feeders and the bucket elevators were furnished by the Webster Manufacturing Co., Chicago. The plate feeders are provided with adjustable throw cranks for use in regulating the amount of feed. Plate feeders are slow moving apparatus and provide the most satisfactory means of regulating flow of material.

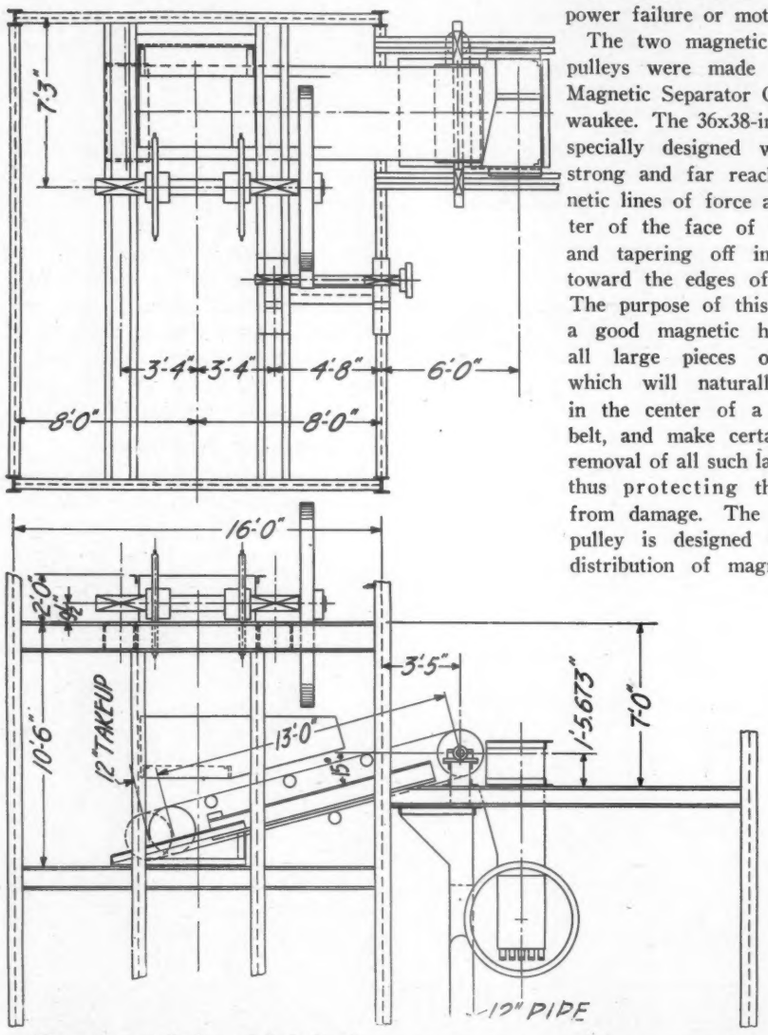
The large continuous bucket elevator is provided with super-capacity style buckets 26 in. wide by 24 in. pitch, mounted between two strands of steel bar bushed-rolled chain. Its centers are 121 ft. and the inclination is 55 deg. The elevator speed is 80 ft. per min. The rollers are fitted with Zerk oilers. The buckets are designed to fill well at steep inclinations, and are so designed and mounted that the gap between them does not increase or decrease as they go around the sprockets, thus eliminating the chance for material to jam or spill as the buckets receive or discharge their load.

The head shaft of the elevator receives its power through a Cleveland worm-gear speed reducer and a cut-steel spur-gear reduction enclosed in an oil tight case. The driving motor is provided with a magnetic brake for preventing the overhauling of the loaded bucket elevator in case of power failure or motor failure.

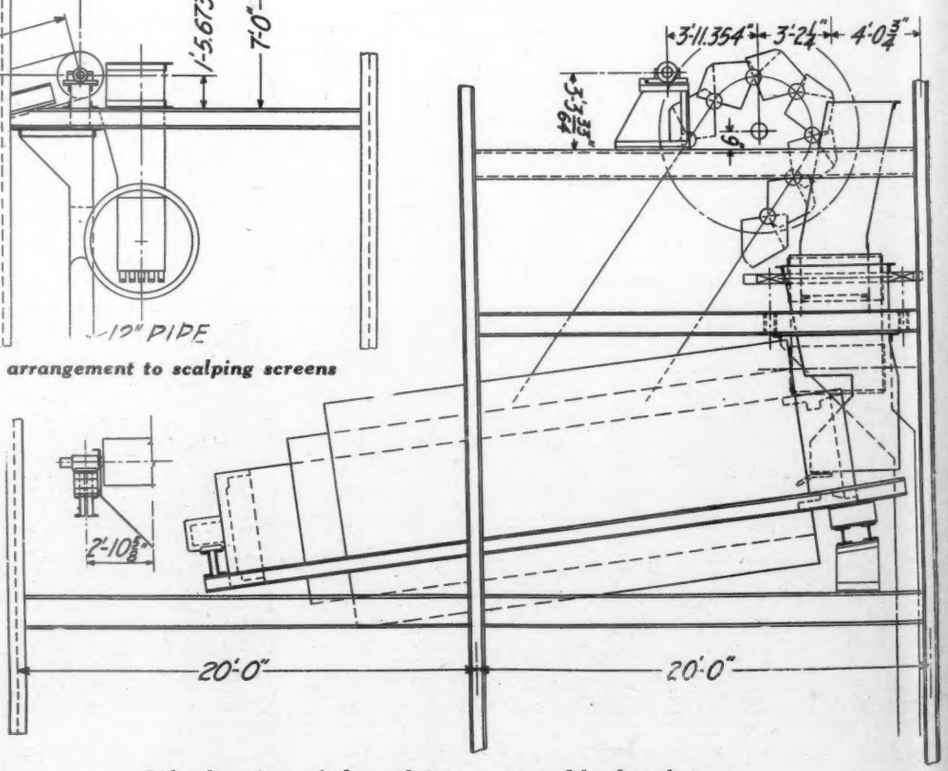
The two magnetic separator pulleys were made by Dings Magnetic Separator Co. of Milwaukee. The 36x38-in. pulley is specially designed with extra strong and far reaching magnetic lines of force at the center of the face of the pulley and tapering off in intensity toward the edges of the face. The purpose of this is to get a good magnetic hold on all large pieces of iron which will naturally ride in the center of a troughing belt, and make certain of the removal of all such large pieces, thus protecting the crusher from damage. The 24 x 50-in. pulley is designed with even distribution of magnetic lines of force across its face, which is proper for this pulley, since there are no large pieces of material passing over it. Both of these pulleys are provided with dead sections at each end in order to prevent the jumping of pieces of iron around the edge of the pulley face. Both pulleys are wound with asbestos insulated wire to with-



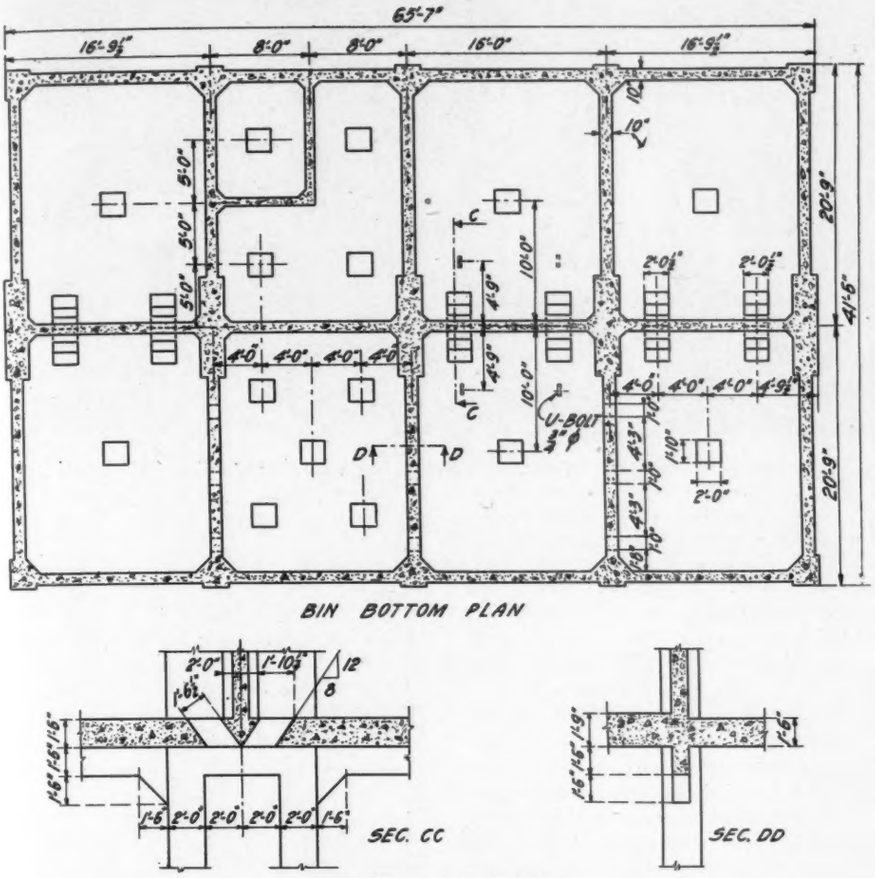
Details of the magnetic pulley and scraper



Elevation and plan of belt feeder arrangement to scalping screens



Side elevations of the scalping screen and bucket elevator



Details of storage bins

stand the temperature rise caused by the heat of the slag being handled. For each pulley there is an enclosed safety disconnect and discharge switch fitted with a pilot light which indicates whether or not the pulley is energized.

The use of magnetic separators in a slag plant is very important, for in the removal of the iron, which amounts to around 2% of the weight of the slag handled, the following advantages are also obtained:

Recovery of a worth-while tonnage of a material much more valuable than slag.

Prevention of damage to crushing equipment.

Possibility of better price for slag free of the iron content.

Greater sale of slag for concrete aggregate if the cause of iron streaks and stains is removed.

Elimination of rejection of material because of iron content.

The revolving screens are specially designed for rigidity, long wear and ease of replacing screen sections, and were built by the France Foundry & Machine Co., a subsidiary of the France Slag Co.

The crusher is a No. 8 McCully gyratory crusher and is driven through an Allis-Chalmers Texrope drive. A flexible drive is desirable for operating crushers and the Texrope was chosen because it possesses the following features:

Absence of slippage.

Resiliency.

Large ratio of reduction, permitting the use of a higher speed and less costly motor.

Multiplicity of ropes, avoiding shut-downs in case of breakage of one or more ropes.

Absence of belt splices and their many disadvantages.

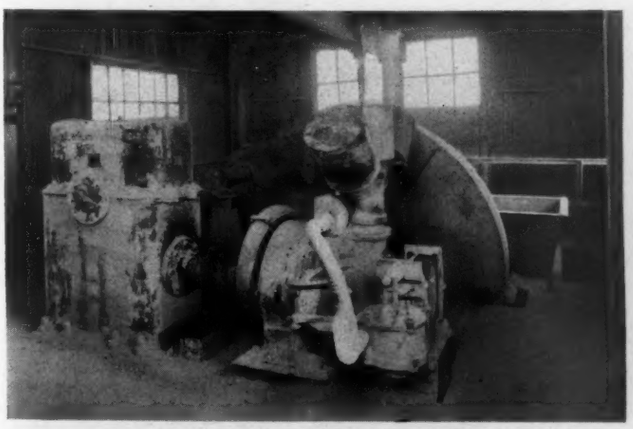
Elimination of cutting and re-splicing in order to take up belt slack.

All drives except the crusher are through Cleveland worm-gear speed reducers and flexible couplings furnished by the Dingle-Clark Co., Cleveland. Speed reducers were installed in order to minimize noise, wear and the accumulation of grease and grime, and to save floor space. The Cleveland worm-gear reducers were chosen because of their known reliability, and because they

Air filters on electric motor

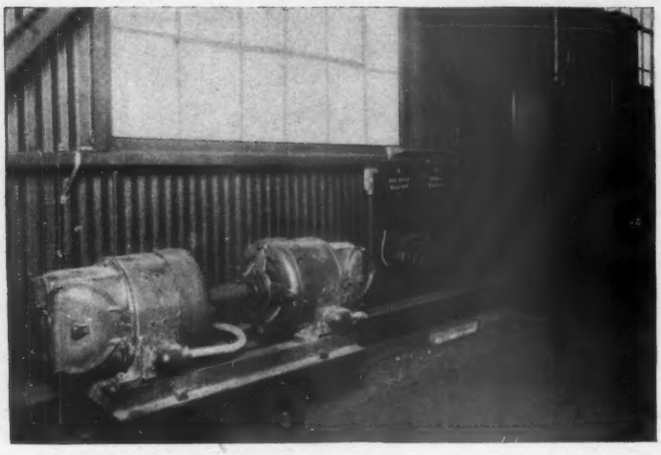
saved more floor space than some other types of speed reducers, in that the worm gear units permit the motor to be located closely alongside of the machine it is driving. The various worm gear units in the plant range in size from 5 hp. to 60 hp.

All the motors and controls in the plant were furnished by the General Electric Co., Schenectady, N. Y. Each machine in the

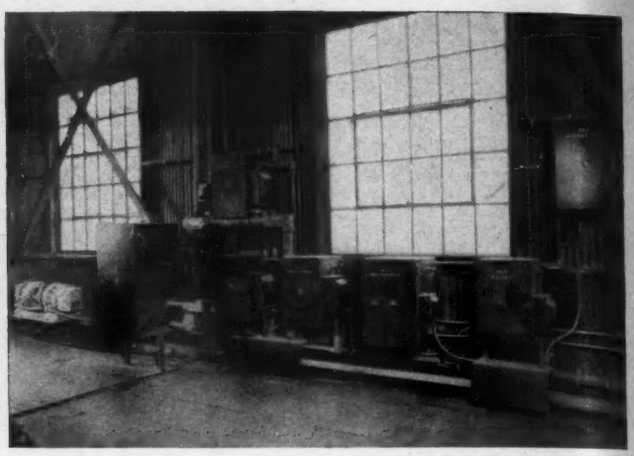


Motor and drive for the large, inclined pan conveyor from the crusher

The 24 in. x 50 in. magnetic pulley and drive above the scalping screen



Generator and control switches for magnetic pulley



Control switches for sequence-starting "hook-up"

plant is individually motor driven. All motors are 230-volt, direct-connected, compound wound and ball-bearing equipped. The 5-hp. motors are of the totally enclosed, exterior fan cooled type, and all motors above 5 hp. are of the enclosed pipe-ventilated type. By the use of ball-bearing, dust-tight motors it is felt that practically no serious motor troubles will develop.

The pipe-ventilated motors take their ventilating air through Protectomotor air filters furnished by Edward P. Martin of Chicago. The filters are mounted direct on the commutator end of the motor frame and are fitted with metal canopies over the top and sides, the bottom being open so that the dust that is continually being shaken from the filter cloths by the vibration of the motor will immediately fall in the clear. The filters are fitted with a compressed air connection for cleaning the cloths and this cleaning is done at regular intervals. The ventilating air is drawn through the motor by a fan mounted on the motor shaft on the opposite end from the intake, and is discharged in a downward direction into the room through a snail-shell blower housing, which forms part of one of the motor end shields.

Both the elevator motors and the 36-in. belt conveyor motor are equipped with magnetic breaks to prevent overhauling in case of power failure. The starting panels are of the magnetic contactor type enclosed in steel cabinets. Low-voltage protection and temperature-overload relay protection are provided.

Acceleration is by time limit rather than by the current limit which has been standard for so many years. With the time-limit system, the accelerating contactors keep coming in one after another with definite time periods between, until the motor either starts or the overload relay trips out. This is very advantageous because when one is ready to start a plant it is desired that the motors start up regardless of current rush through the motor windings, provided that such current rush is not so great or of sufficient duration as to dangerously heat the motor windings, and here overheating of the windings is guarded against by the overload relays. With the old current-limit acceleration the motor, if heavily loaded at the start, would draw a current on the first acceleration point so great as to prevent the second contactor from coming in, and still possibly not great enough to trip the overload relay, with the result that the starting resistance would probably be heated to the melting point and the motor would neither start nor be taken off of the line.

All motor starters are electrically interlocked for sequence starting. The following is a list of the several results that were desired from the use of the sequence motor control wiring:

1. To start the motors one after another in the opposite order to the flow of material through the plant, so as to avoid piling up material on a machine that has not yet started.

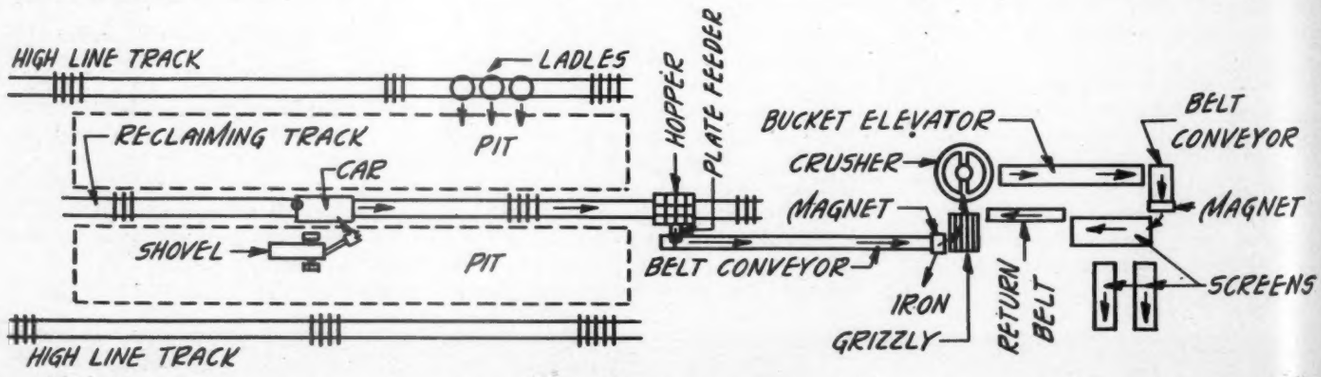
2. To start only one motor at a time, thus avoiding a large peak of demand from the power line.

3. In case a certain machine is purposely shut down or shuts down due to overload, to automatically shut down all other machines tending to convey material to that particular machine, thus avoiding a piling up of material upon the shut-down machine.

4. To provide individual jogging facility for each machine with absolute assurance that the machine while being jogged will not start other machines, or be started by other machines.

5. To provide for cutting out of the sequence while the plant is either running or at rest, a machine or group of machines without disturbing the sequence of the other machines and without even momentarily de-energizing the panels of the other machines that might be running.

6. To likewise provide for cutting back into the sequence while the plant is either running or at rest, any such machine or

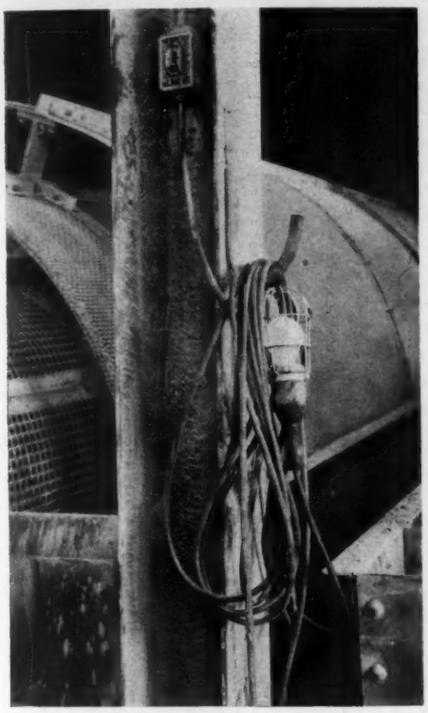


Flow sheet of material in the France plant

group of machines without disturbing the sequence of the other machines and without de-energizing the panels of the other machines that might be running.

7. To provide as a safety measure, emergency stop and safety lockout stations located in close proximity to each machine.

8. To provide for forward and reverse jogging (for the crusher panel only) thus



Type of extension cord and hanger used at the France plant

insuring that the crusher can be started up even when filled with slag.

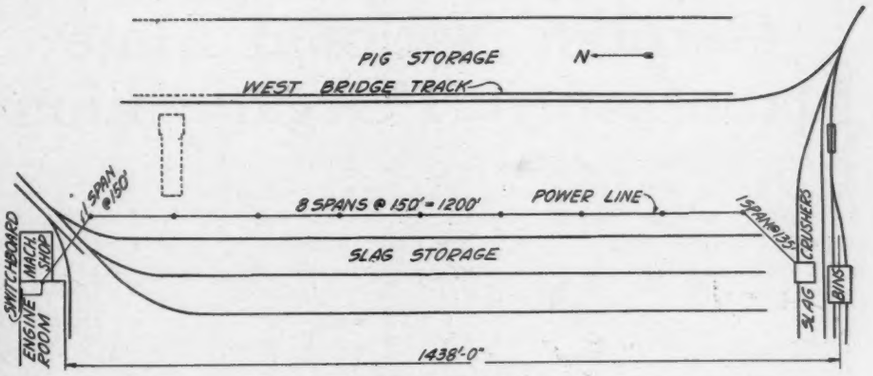
9. To provide automatic plug-stopping of the crusher motor in case a solid chunk of iron gets into the crusher.

10. To provide for push button operated emergency plug-stopping of the crusher motor for cases of extreme emergency.

11. To provide (for absolute safety during repair or inspection of panels) a convenient means of disconnecting from the panel all live current coming into the panel through the main wiring or control wiring.

12. To prevent starting the first magnetic separator pulley until this pulley is energized, thus insuring against the passing of slag over the pulley without proper removal of iron.

The above desired results are all actually obtained and it is felt that this control system is as near hazard-proof as can be had.



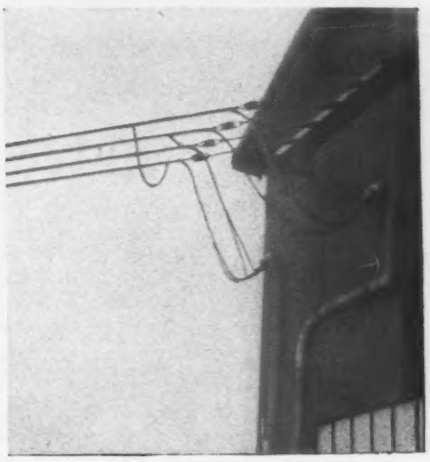
Power-line layout

Specially-Built Chain-Bucket Elevators

The small inclined chain elevator is of a somewhat unusual type. In this elevator the buckets, which are of the ordinary belt-elevator type, are mounted on two strands of 4-in. pitch bridge-link chain of the Union Chain and Manufacturing Co., Sandusky, Ohio. There is just one pair of 23-tooth idler sprockets located midway between the head and tail sprockets. It was found that with only one pair of idler sprockets the chain would conform to the curvature of the sprocket more easily and quietly. This type of elevator construction should prove desirable wherever there is need for a small high-speed inclined elevator.

For starting and stopping signals in the plant electric sirens are used. It has been found that none of the small 110 or 220-volt electric sirens now on the market possess a tone of sufficiently high pitch to be heard above the noise of the revolving screens and steel chutes. It was therefore necessary to make special assemblies of high pitch siren fans and 220-volt motors, which have proven very successful.

All power and lighting wiring in the plant is in galvanized conduit in order to resist the acid fumes. The installation of wiring and electrical equipment was in the charge of J. A. King, district electrician of The France Slag Co. The power supply is 230

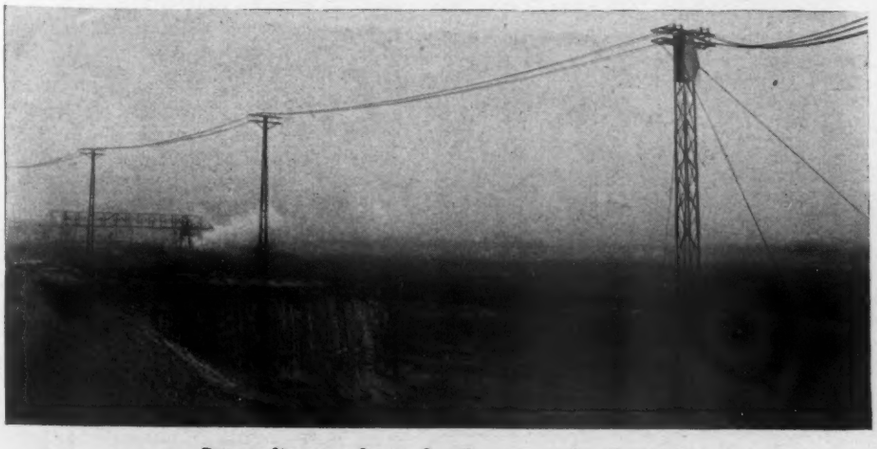


Detail of power line connections at the plant

v., direct-connected, and is manufactured by the Federal Furnace Plant, in whose yards the slag plant is located. The power is brought to the plant by four 750,000 circular-mill, stranded, weatherproof cables mounted on galvanized expanded metal steel poles, made by Bates Expanded Steel Truss Co.

A small brick office, scale house and locker room has been provided. It is equipped with Arcola heater, automatic electric water heater, lockers, wash trough, toilets and shower baths. Railroad cars are weighed from one side of the office and trucks from the opposite side. Both scales are Fairbanks.

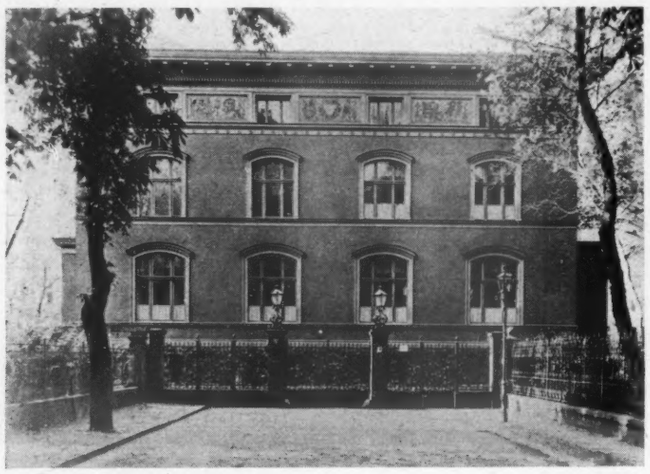
The supervision of the plant now is and was during construction in charge of G. G. Black, district superintendent, and E. L. Adams, resident superintendent. The general design and engineering of the plant were in the charge of the author, who also worked out the "hook-up" for the sequence motor control described above.



Power line to plant, showing type of pole used

German National Lime Manufacturers' Organizations

GERMANY, with a population of about half of that of the United States and an area of something like 200,000 square miles as compared with 3,000,000 square miles of this country, produces and consumes nearly as much lime as the United States.



Headquarters of the German Lime Manufacturers' Association

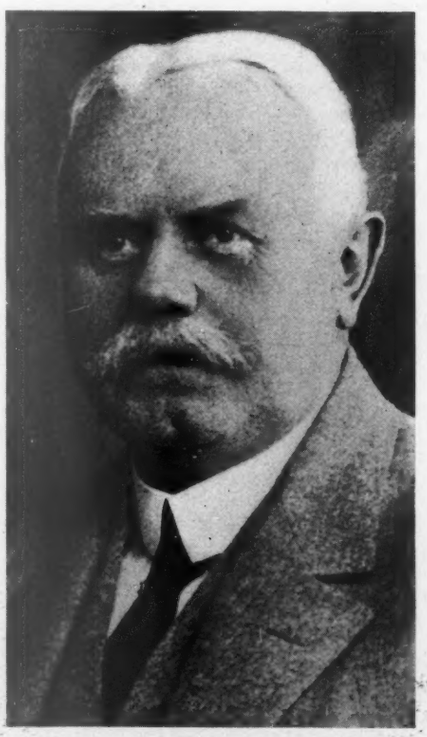
The answer seems to be that lime in Germany is used in larger amounts in industry, construction and agriculture, than in this country. We know, for example, that lime is used in Germany very extensively in the steel industry as a fluxing agent, where limestone is used in this country. We know that sand-lime brick are produced in far greater quantities in Germany than in this country. Lime is also more extensively used for construction purposes.

In Rock Products, March 17, pp. 88-89, in discussing the present problems of the American lime industry, we described the national organization of German lime manufacturers. Credit should have been given for this information to Hans Urbach, Dipl. Eng., business manager of the German Lime Association, or more exactly the Association of German Lime Manufacturers. Mr. Urbach communicated this information to Victor J. Azbe, consulting engineer, St. Louis, Mo., as a result of Mr. Azbe's trip to Germany and other European countries to study the lime industry.

Mr. Azbe's own comments in connection with his study of the work of the German Lime Association, and his knowledge of lime manufacturing conditions in this country, is also very apropos at this particular time. He writes:

"No industry can continue to be generally prosperous for a long period of time except the producers or manufacturers in it show a willingness for helpful co-operation, a co-operation based upon a sound and honorable code of ethics, an understanding of difficulties that confront both the individual producers as well as the industry as a whole. While this statement is fundamental in nature, it applies, no doubt, more so to the lime industry than to others that have had a more logical, more carefully controlled growth. The lime industry apparently 'just grew.'

"There are signs on all sides that little, very little, is known about good lime, cheap making of lime, proper distributing and proper selling. Since many apparently don't know what lime costs them, how could they be expected to know what it should cost them? It appears to be as if a spirit of crudeness pervades the industry to which a spirit of—I don't give a d—— for anybody but myself is being added from several quarters where there should be co-operation.



Dr. Hartwig Schlueter, head of both German National Lime organizations, and executive head of the Reinsch Westfalischen Kalkwerke, the largest lime manufacturing company in the world

Hans Urbach, business manager of the German Lime Association

"These conditions naturally are not helpful to growth of the lime business. When lime men don't know the technical fundamentals of good lime manufacture, they can hardly expect to know anything of industries buying their lime or that could buy the lime. It is difficult to imagine any industry that would sell a product so low in quality as a certain lime manufacturer who sold lump lime recently, so poorly burned that it contained only 62% oxide; and while this is an exception, to find shipments of 80% oxide is not unusual. How many lime manufacturers in this country today would know how to burn lime so that it contains less than 0.2% SO_3, when many produce lime with ten times this amount of sulphur?

"With all this in mind, the writer was naturally interested in organizations of lime manufacturers in Europe. In England there is no real combination. There are several organizations, but their functioning is not such that anything much could be learned from them. In Germany, however, things were found to be different. There is in existence a strong, powerful, well organized association functioning apparently almost to perfection and in many channels where the American organization never has tried to function.

"While in Berlin, the writer called at the headquarters building, which is owned by the association, in a most pleasant location. Hans Urbach, business manager, was most courteous to the writer, helpful in establishing contacts with several outstanding lime manufacturers.

"The chairman of the executive committee of the German Lime Union and chairman of the Association of German Lime Manufac-

turers is Dr. Engineer e. h. Hartwig Schlueter, who by the way is also first director of Rheinsch Westfalischen Kalkwerke, the largest lime plant system in the world. By first director of a corporation in Germany is practically meant president.

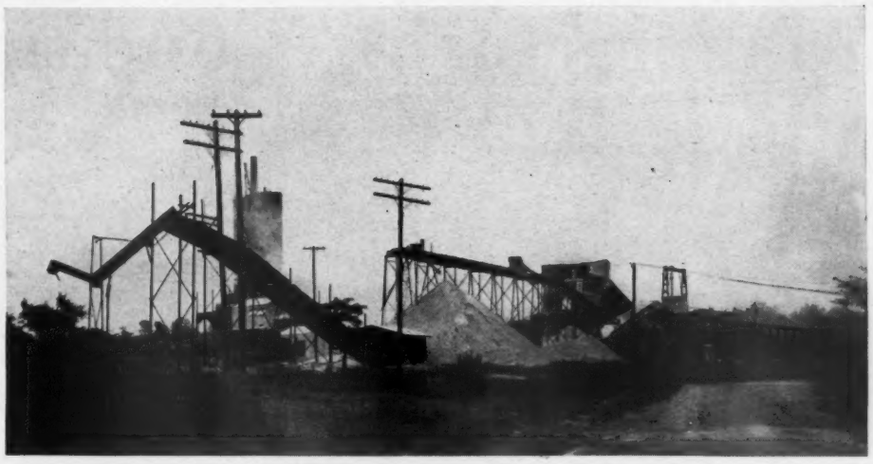
"Since the organization of such an association is rather complex, the writer asked Mr. Urbach to give in an extended form, its composition as well as its functions to which Mr. Urbach very kindly agreed. The information given in the issue of ROCK PRODUCTS referred to is Mr. Urbach's contribution."

Alabama Lime & Stone Co. Operating New Kilns at Calera

THE Alabama Lime and Stone Co., Birmingham, Ala., recently completed the first unit of its new plant at Calera, Ala., consisting of two kilns and a hydrating plant. The plant will ultimately consist of eight kilns in all. The kilns, erected on a heavy structural steel base, are 17 ft. in diameter and stand 72 ft. above the floor line. The next construction will consist of a storage bin of concrete to hold 2000 tons of lime, which will be constructed during this year. At this plant the raw material is handled from the quarry through the crushing and screening plant into the top of the kilns automatically. Beside producing 1200 bbl. of lime daily, this plant also produces 4000 tons of crushed stone per day. Operations at the Varnons plant of the Alabama company are also being continued.

The first two kilns at the Calera plant during construction

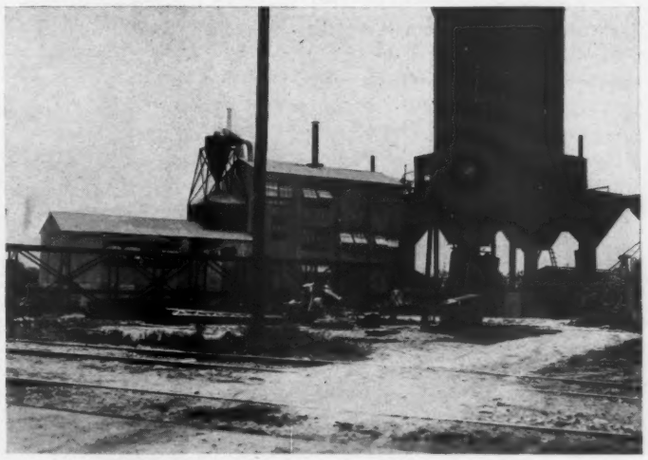
The Calera plant is being erected under the plans of the Schaffer Engineering Co.



General view of the completed portion of the plant of the Alabama Stone & Lime Co. at Calera

The Ingalls Iron Works Co. furnished the structural steel for the new plant and the Southern Cement Co. of Birmingham, Ala., supplied the cement. Other contracts included the hoists furnished by Charles T. Lehman; chain drives by Link-Belt Co, Chicago, and automatic stokers by Marion Machine, Foundry and Supply Co., Marion, Ind. The Birmingham Boiler and Engineering Co. erected the kilns and built the plant buildings and skipway.

The general offices of the company are in Birmingham, and the officers of the concern are E. T. Shuler, president; R. N. McDonough, vice-president, and Harry Burgess, secretary-treasurer.—*Dixie Manufacturer.*



The hydrating plant and two completed kilns of the Alabama company

Natural Protective Crust on Stone

A THEORY which has long been held by stone producers and many others concerned with the weathering of natural stone is that when the material is exposed to the weather a protective skin or crust is formed which tends to overcome the effect of the elements. For this reason it is often stated that cleaning methods, such as sand-blasting or any others which remove some of the surface of masonry, will destroy this natural protective coating and materially shorten the endurance of the stone.

Some weathered samples of limestone were recently subjected to experiments at the U. S. Bureau of Standards to determine if such a protective crust actually exists. One sample was a window sill from a building about 40 years old and another was a sill from a building about 30 years old. The two sets of specimens were prepared from each sample, one set having as one surface the weathered face of the stone as removed and another having as one surface a face cut 4 in. below the weathered face. These were tested for permeability, absorption and abrasive hardness. Permeability tests were made under a water pressure of 100 lb./in.^{2}, and absorption tests were made in such a way that the water was absorbed only by capillary forces through one face of the slabs. In all tests the results indicated that stone near the weathered face was more absorptive, more permeable to water and softer than the material 4 in. below this surface. The permeability of the specimens cut at the exposed face of the sample 40 years old was about twice as great as the permeability of specimens cut from the interior. Hardness tests indicated that the weathered surface was abraded about 50% faster than the unweathered stone.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Manufacturing Conditions Influencing Setting Time of Portland Cement

Type and Actions of Retarders—Effects of Seasoning, Heating, Fineness of Cement and Retarder and Influence of Alkalis and Lime Ratio on Setting Time

By Richard K. Meade
Consulting Chemical and Industrial Engineer, Baltimore, Md.

IT IS QUITE WELL UNDERSTOOD in the cement industry that cement clinker if ground alone will generally produce a cement which will set too quickly to permit of its being used for the general run of concrete. In order to delay the set of the cement sufficiently to permit of proper manipulation of the concrete in which this is used, it is the universal practice to add to the clinker before grinding calcium sulphate in some form or other. Gypsum being the cheapest form of this reagent is the one most commonly employed, although plaster of paris is also used at a few mills. As this latter substance can be obtained very finely ground as an article of commerce, it is often employed where it is necessary to increase the calcium sulphate in fully ground cement—the two being mixed in a screw conveyor at the plant, or in the concrete mixer on the job.

In spite of the fact that calcium sulphate is always added to the clinker from the rotary kiln in the manufacture of cement, not all clinker if ground alone will produce a quick setting cement. Some clinker can be ground alone and will produce a slow setting cement. Usually, however, this cement will become quick setting on seasoning.

Addition of calcium sulphate improves very materially both the plasticity and strength of cement. The value of this compound is not entirely, therefore, due to its action as a retarder.

Substances Which Retard Setting Time

Calcium sulphate is not the only compound which can be employed to retard the set of cement. Calcium chloride acts quite similarly to gypsum in this respect, but is not so desirable for a number of reasons, one of which is the fact that it is a soluble salt and, therefore, likely to cause efflorescence on the concrete. It is also a very deliquescent salt and hence difficult to keep and handle in the cement plant. Calcium chloride is a by-product from the manufacture of soda from salt by the Solvay process, but as so obtained it is in the form of a rather dilute solution from which it must be collected in a form applicable to cement manufacture by a relatively speaking expensive evaporation. In view of these facts and the low cost of gypsum in most localities, it seems now unlikely that calcium chloride will be employed as a retarder in cement manufacture.

Water is to some extent a retarder. So far as I know, however, it cannot be made to alone retard the setting time of cement.

Richard K. Meade

It has been employed, however, when cement low in sulphur trioxide (SO^3) was desired, to reduce the amount of retarder below what would ordinarily be required. The process devised by Bambier, an English engineer, consists in introducing superheated, dry steam into the tube mill through a hollow trunnion. In this way the cement is ground in an atmosphere of steam and naturally absorbs some water—the latter, of course, reacting with some of the more readily hydrated compounds of the cement.

I believe that the use of steam in the manner described is quite usual in England; but, so far as I know, the few mills in this country which tried to apply the process abandoned it after employing steam for sufficient length of time to demonstrate fully its worth. As applied in England, it is necessary to add some gypsum to the cement, the steam only serving to reduce somewhat the quantity of the gypsum necessary. In my own limited experience with the process, it was also found necessary to add some gypsum in order to retard the set of cement to the usual requirements. I found, however, that by the use of steam only about half as much sulphur trioxide was necessary as where the steam was not employed. The steam tended to correct unsoundness, but on the other hand seemed to decrease the strength of the cement, caused much trouble with the grinding efficiency of the mill, and generally proved less satisfactory and more expensive than the gypsum.

Calcium Sulphate as a Retarder

There seems to be no objection now to cements containing up to 2% sulphur trioxide. Indeed, there is no reason why cements containing even more than this amount of sulphur trioxide should not be employed for work where the concrete is not subjected to sea water or mine waters.

Practically all experiments made with quantities of gypsum within the range of those likely to be used in cement manufacture show that gypsum not only delays the set, but also increases the early strength without any tendency towards failure at long time periods. The importance of early strength is well understood. The slow hardening cements have been well adapted to older methods of construction, but the success of portland cement as a material of construction is largely due to the speed with which building operations can be carried on where it is used. The demand for low early strength and gradual increase is a shibboleth of a former generation of engineers—a holdover from the use of Rosendale, "improved" and natural cements, materials now obsolete. Increasing the amount of gypsum over that now allowable by standard specifications would make higher early strength and fully as durable concrete.

Forms of Calcium Sulphate

When pure, gypsum consists only of calcium sulphate and water—its chemical formula being $CaSO_4 \cdot 2H_2O$. An associated mineral is anhydrite. This, when pure, contains only calcium sulphate. Its chemical formula is $CaSO_4$. It contains no water—hence the name "anhydrite." Plaster of paris (or "plaster") is an intermediate, artificial product made by calcining gypsum at a heat sufficient to drive off three-quarters of its water. It has been assigned the formula $2CaSO_4 \cdot H_2O$. The relation between the three forms of calcium sulphate is shown below:

Gypsum has a hardness of from 1.5 to 2; anhydrite, 3.5 to 4 on the Mohr's scale.

			Percentage Composition
Gypsum—			
Calcium sulphate, $CaSO_4$	79.1%	Sulphur trioxide, SO_3	46.5%
		Calcium oxide, CaO	32.6%
Water, H_2O	20.9%		20.9%
	100.0%		100.0%
Plaster of paris—			
Calcium sulphate	93.8%	Sulphur trioxide	55.2%
		Calcium oxide	38.6%
Water	6.2%		6.2%
	100.0%		100.0%
Anhydrite—			
Calcium sulphate	100.0%	Sulphur trioxide	58.8%
		Calcium oxide	41.2%
Water	0.0%		0.0%
	100.0%		100.0%

The two minerals are about equally soluble. Various authorities place this at one part in 400 to 500 parts of water. As found in nature, gypsum usually contains some impurities, chiefly clay matter, which is revealed in the amount of silica, iron oxide and alumina and calcium carbonate shown on analysis.

Occurrence of Gypsum

Gypsum is a mineral found quite widely distributed throughout the country. The occurrence is in the form of beds sufficiently thick to permit of mining or even in some localities open quarrying. It can hence be produced quitely cheaply and usually occurs close enough to the cement mills to permit of its being brought to the latter at comparatively low freight rates. It would seem to meet admirably, therefore, the requirements of a retarder. Usually from 10 to 15 lb. of this mineral are required per barrel of cement, and it can in most cement manufacturing localities be purchased at a delivered price of from $5 to $7 per ton, so that the cost of retarding cement may be considered as from 3 to 4 cents per barrel of cement produced.

The most important gypsum producing localities, particularly with regard to the cement manufacturer, are in north-central New York, southwestern Virginia, Kansas, Oklahoma, Michigan, central Iowa, Ohio, Texas, Utah, Colorado, California, and in the Canadian provinces of Ontario, Nova Scotia and New Brunswick. It will be seen, therefore, that the mineral is quite widely distributed and that most of the important cement producers do not have far to go for their gypsum.

The deposits of the Maritime Provinces in Canada are extensive and as they are located for the most part near tidewater they are well adapted to supplying the great cement industry of the Atlantic seaboard with gypsum. The gypsum found in these provinces is an unusually pure form of calcium sulphate.

Active Constituents of Gypsum

Indications are that the value of the gypsum as a retarder is due to the amount of calcium sulphate contained in the latter. My own experiments clearly prove that the various forms of calcium sulphate all have a retarding effect on cement clinker. In this connection, it should be noted that the action of such retarders as gypsum, plaster of paris and anhydrite will depend not only on the amount of sulphur trioxide which they contain, but also on the fineness to which they are ground and possibly the thoroughness with which they are mixed with the cement. Certainly in compounds of such low solubility as these, the amount of surface exposed to the solvent will materially affect the rate of solution, and since no retarding action can take place until solution is effected, the fineness to which the retarder is ground is important, as this increases the surface exposed. Most investigators agree that plaster-of-paris has a greater effect as a retarder than other forms of sulphate. This is explained by the fact that it is not only about five times as soluble as gypsum, but is also softer and if ground with the cement, as it would usually be in practice, would be reduced to a much finer condition. Similarly, gypsum is of about the same solubility as anhydrite, but the latter is the harder of the two.

For the above reason it is very difficult to determine the relative efficiency of these retarders by laboratory experiments. The latter seldom approach near enough to mill conditions to be of much value. This is particularly true with regard to grinding when the limitations of the sieve and elutriation tests, and even "air analying," are considered. Unquestionably in the hardening of cement the "flour," "impalpable powder," or whatever it pleases the reader to call those particles beyond the range of laboratory size measurements, play the major part. Certainly a clinker ground to pass a certain sieve and a retarder similarly ground and then mixed may and probably do act quite differently from a similar mixture ground together in a full size mill. Then, too, different clinkers act differently as to setting time under different methods of grinding, seasoning, etc.

In spite of the fact that LeChatelier stated that either gypsum or plaster of paris could be employed to slow the set of cement, the general impression seems to be that the gypsum must be converted to plaster in order to be effective and that this conversion is effected by the heat of the grinding mill. Those who have made the experiment, however, have found that in most instances finely ground gypsum added to fully ground clinker will produce a slow setting cement. It is, of course, possible that in this case the gypsum is dehydrated by the cement in the dry way merely by mixing, due to the strong affinity of cement for water. Such dry reactions are unusual and I doubt if one occurs in this case. The element of time would enter into such a reaction and in many experiments, at any rate, the gypsum and clinker were usually mixed rapidly and the

Editor's Abstract

THE utilization of various compounds and substances which are generally used or may be used to retard the setting of portland cement are considered. The forms of calcium sulphate are described and observations made on their respective ability to retard. From various data the author concludes that the active retarding constituent is SO_3 hence anhydrite is desirable because of its high SO_3 content. Some settling troubles of cement are directly traceable to the composition of the cement and failure to mix the retarder properly with the cement.

The theories of retarding action are discussed especially from the viewpoint of abnormal results in manufacture. The influence of water or steam (seasoning of clinker), heating, fineness of retarder, alkali and clinker composition are considered. Balance or ratio between silica and alumina, indicated as "index of activity," is regarded as the important factor in controlling the time of set. Ratios less than 2.5 generally yield cements that are quick-setting or become so on seasoning and those over 5 are apt to make cements hard to burn and slow setting. The author considers the desirable "lime" ratio (the ratio between the lime and other constituents as silica, alumina and iron oxide) as about 2. The usual remedy for unsoundness is finer grinding of raw materials.

setting time test made immediately after mixing. Since gypsum is quite soluble in water, it should not be necessary to convert this to plaster in order to have it active.

There seems to be some opinion that the gypsum from certain localities is more efficient than that from others, that low grade gypsum is more efficient than high grade, that anhydrite cannot be employed as a retarder, etc. So far as I have been able to determine by laboratory and plant investigation (1) there is no difference between gypsum from one locality and that from another when they are of the same SO_3 content, (2) the retarding action is due entirely to the amount of sulphur trioxide contained in the gypsum, there is hence no advantage in employing low grade gypsum, rather the contrary; and (3) anhydrite is an effective retarder for cement clinker.

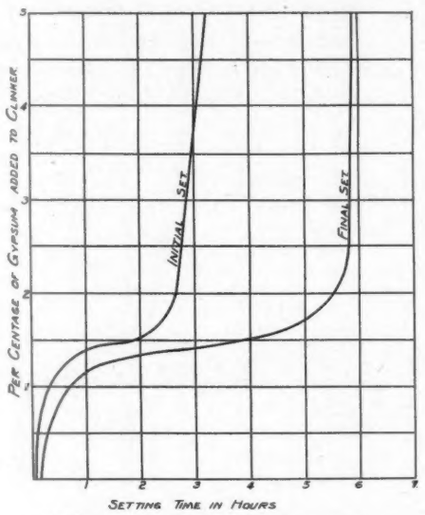
Conditions Affecting Retarders

Where trouble is experienced with the setting time of cement, the only matter to be determined so far as the retarder itself is concerned is to see that the latter is added in sufficient quantity and regularly and that the mixing and grinding are properly done. Naturally, when the retarder is ground in with the clinker, no uneasiness need be experienced on the latter score. Many plants, however, have very unsatisfactory arrangements for mixing the clinker and the gypsum and hence the amount of sulphur trioxide in the cement varies.

Where trouble is experienced with setting time the first step is usually to increase the quantity of gypsum to the point where the percentage of sulphur trioxide in the cement just comes safely under the limit of 2% set by the specifications. This seems always wise. When this does not correct the trouble, other remedies indicated elsewhere in this paper must be tried. Changing the retarder itself will not be sufficient. Where this has been done and the trouble with the setting time has been corrected, the chemist has unconsciously at the same time he changed retarders corrected the other condition which caused the cement to set quickly. I have investigated setting time troubles at many mills and in no instance have I ever found the retarder at fault. The trouble has always been due to other conditions, and the correction of these has resulted in normal setting time.

I also find that it makes no difference whether the cement is high or low in alumina, the retarders are equally effective. In other words, it seems to make no difference whether the retarder is low grade or high grade gypsum, whether it contains anhydrite or not, if the cement has abnormal setting properties it will develop these as quickly with one retarder as with another, having due regard, of course, to the varying amounts of sulphur trioxide brought into the cement by the retarder, etc.

There seems to be a general idea among those unacquainted with the practical side of cement manufacture that the setting time of the cement is controlled entirely by the amount of retarder added to the clinker and that the rate of set can be nicely graded by the amount of gypsum or plaster employed. This is by no means the case. There are many factors aside from this which influence the setting time of cement, some of which are understood and recognized but many of which are not. Generally, additions of successively increasing proportions of retarder to clinker have little effect in the case of a quick setting clinker until a certain proportion is reached and then the clinker changes from quick to slow setting quite suddenly. Sometimes no effect is produced until as much as 2% SO_3 is present, then an addition of only 0.1% of SO_3 will be sufficient to slow the set from a few minutes to several hours (graph above).



Effect of Gypsum on Time of Set

I think almost all cement chemists agree that there is much more to making a slow setting cement than merely adding a retarder in proper quantity. Nearly all works have experienced at times runs of clinker which they could not slow with an amount of gypsum or plaster which would allow the SO_3 to remain below the limit of 2% prescribed by the standard specifications. Sometimes the set of the clinker could be retarded to the required time when the cement was tested fresh, but on seasoning the cement developed an accelerated set—"turned quick setting," as we say in the industry. It is not my purpose in this paper to discuss the value of various retarders, but rather to treat of the question of set from the side of the clinker itself.

It is unfortunate that we do not know why calcium sulphate retards the set of cement. Various investigators write about the reaction between the calcium sulphate and the alumina, the formation of "sulpho-aluminates," "delayed crystallization," "delayed hydrolysis," etc., according to the views they hold as to the cause of the setting and hardening of the cement. In the light of more recent theories, it seems probable that the calcium sulphate or rather its component ions in some way delay the formation of the silica and alumina gel. I think few investigators of this day look upon the setting and hardening of cement as occurring in two stages; in one of which the tri-calcium aluminate is acting and in the other the tri-calcium silicate. It seems much more probable that the two compounds hydrolize side by side—probably at a different rate, it is true. It seems very likely, therefore, that the retarder reacts with both the aluminates and the silicates.

It is also probable that the reaction is a wet one and that no reaction takes place between the clinker and the retarder until the water is added. If this is granted, then all forms of calcium sulphate should have *per se* the same retarding action, since in solution they would all be reduced to the same components. This statement should, of course, be qualified by a consideration of the amount of calcium sulphate going into solution. This would vary with the amount of calcium sulphate present, the solubility of the different forms of calcium sulphate and also with the condition of the reagent itself, as, for example, the fineness to which it is ground.

Dehydration of Gypsum

Aside from this, gypsum and plaster carry into the cement some water. The affinity of cement clinker for water is quite marked and the water of gypsum is very loosely held in combination. Various authorities have commented on the ease with which some of the water can be driven off. For example, the water of crystallization may be drawn off gypsum at room temperatures by enclosing in an ordinary sulphuric acid desiccator. According to Davis (*J. Soc. Chem. Ind., 1907,* p. 733) gypsum begins to lose its water of crystallization at 208 deg. F. and a large part of its water may be driven off at 225 deg. F., but under some conditions gypsum begins to lose its water of crystallization at 104 deg. F., and some analysts have called attention to the fact that even grinding in a mortar in the laboratory is sufficient to drive off some of the water. In a modern tube mill the temperature usually ranges from 250 to 300 deg. F. In addition to this, there is the pressure caused by the weight of the charge. Hence under cement grinding conditions it is almost certain that gypsum loses *most* of its water. It is probable that this water is absorbed by the cement as fast as liberated and that this tends to hydrate a certain portion of the cement.

This subject has been brought up with the idea of calling attention to the fact that gypsum, anhydrite and plaster of paris might give quite different results added to the same clinker (1) when fresh, (2) after having absorbed some moisture by seasoning, wetting, etc., (3) when ground at varying temperatures, (4) when ground where

free escape of the moisture from the mill was permitted, etc.

We have no positive data on which to predict what constituent of the cement is first hydrated, but from the fact that unsound cement when exposed to moisture becomes sound before any appreciable amount of hydrolysis of the cement itself takes place, we are led to believe that the free CaO is first acted on forming the hydrate. Assuming that 3% gypsum, or 12 lb. per barrel, is added to the clinker, there would be introduced into the latter 2.5 lb. of water per barrel of cement. This would be sufficient if entirely driven off to hydrate 10.5 lb. (or 2.7%) of lime. This is equivalent to 4% of the total lime in the cement. We know that cement clinker seldom contains as much as 2.7% free lime. It is also quite improbable that all the water in the gypsum is transferred to the cement. Some steam usually issues from the vent of a tube mill, showing that the power of clinker to absorb water during grinding is limited. It is quite probable also that all the water in the gypsum is not driven off of the latter during the grinding, etc. These facts are cited largely by way of calling attention to the desirability of considering other factors in the question of retarding beside the sulphur trioxide. They should not be construed as indicating the need of any such reaction occurring in ordinary circumstances. We know that gypsum if finely ground and still containing practically all of its water of crystallization will slow the setting time of cement when merely mixed with it and also that anhydrite if ground with clinker will act as a retarder also.

Effect of Seasoning on Setting Time

As stated previously, cement often has a satisfactory setting time when freshly ground but on seasoning becomes quick setting. This change seems only to occur in the case of cement exposed to the air. That is, of two samples, one preserved in a paper bag and the other in an air-tight can, the one in the bag will "turn quick setting," while the other will remain slow setting. This seems to indicate the hydration and carbonation (since air contains carbon dioxide) of some compound in the cement which had influence on the setting time of the cement.

It is difficult to say what this compound is. Either calcium oxide or calcium hydrate added in connection with gypsum have a retarding action on cement clinker. Cements which show this property of turning quick are usually low in lime and such cements usually contain but little free lime. The compound which seems to be most acted on by storage is this latter. It is, of course, quite probable that cement low in lime may also contain enough free lime to influence the setting time of cement. Free lime is less often due to faulty proportioning than to insufficient grinding of the raw materials or to under-burning. Even cements low in lime may be unsound from these causes. It is, of course, possible that the free lime is converted to carbonate by exposure to the air and so converted to an inactive form. So long as free lime is present the cement sets slowly. When this is carbonated, the restraining action is lost and the cement sets quickly, etc.

Some authorities seem to regard the action when cement becomes quick setting as due to the reverting of the plaster of paris to gypsum by water absorbed from the atmosphere. Against this is the fact that not only the mineral gypsum, but also the artificial gypsum produced by the hydration of plaster will slow the set of cement. At one small plant refuse hardened (set) plaster of paris was used as a retarder. This was, of course, fully hydrated plaster. It was found just as efficient as gypsum. Naturally so, as it was of the same chemical composition. In considering the use of such refuse material, it is well to point out that it often contains substances which may aversely effect the cement such as glue, slaughter-house refuse, alkaline salts and other materials usually mixed with plaster of paris to retard the set of the latter.

Quick-setting cement may often be made slow-setting by addition to it of hydrated lime. Some instances have come under the writer's observation where quick-setting cement was made slow-setting by adding water to the clinker before this was ground. In one particular instance, quite a large amount of clinker in storage was found to be quick-setting even with sufficient gypsum added to bring the sulphur trioxide up to 2%. It was found that by drenching the clinker with water before it was ground, the cement could be made slow setting. The dry clinker gave cement with a loss on ignition of from ½ to 1%, the wet clinker a loss of from 1¾ to 2½%. Unfortunately at that time no methods were available for determining the free lime in cement, so it is not known whether this compound was unusually high or low in the clinker. The cement resulting from it was sound, however.

During the investigation of this lot of clinker it was found that in some instances if gypsum was added to the fully ground clinker this did not retard the set, but that if the mixture was heated in an oven for one hour at 110 deg. C. the cement had a normal set after cooling. Possibly the water was driven off the gypsum and helped hydrate the compounds which made the cement quick-setting or else formed calcium hydrate which had a retarding action on the cement. Plaster would not slow the set of these samples either before or after heating.

It is quite certain that seasoning the clinker will influence materially its setting time. The general effect seems to make cement quicker setting, although there are numerous instances when seasoning seems to have also retarded the set. Probably in two such opposite cases quick-setting was caused by different things. In all instances which have come under my observation where seasoning clinker has quickened the set of the resulting cement, the clinker has been low in lime and relatively speaking high in alumina. I have in mind three instances where large amounts of clinker stored over the winter in the open, exposed to rain, etc., gave quick-setting cement on grinding in the spring. In all instances this clinker was surplus and represented only part of the day's run of the kilns, the balance being ground as burned. The cement produced from the latter was of perfectly normal setting time. It was only after storing in the open that it gave quick-setting cement. Furthermore, the cement made from freshly burned clinker did not, so far as observation went, turn quick-setting on storage in the stockhouse. It is interesting to note here that this clinker also was relatively high in alumina and low in lime.

Effect of Heating on Setting Time

It has been observed quite frequently by different writers that if cement is heated for some time at a temperature much above 400 deg. F., it will turn quick-setting. Various explanations have been offered for this. Most of the older writers seem to hold to the idea that dehydration of the gypsum takes place under these conditions and that this renders the latter insoluble. This theory hardly seems tenable. My experiments with dehydrated gypsum indicate that this substance is an active retarder. Some reaction not now understood may take place in the dry way between the gypsum and some components of the cement rendering the former inactive, heat being known to promote such reactions between dry substances. Analysis shows no water is actually driven off the cement at a temperature which will make it quick-setting. While gypsum will lose its water at comparatively low temperatures, calcium hydrate is not so easily decomposed, the temperature necessary here to bring about dehydration at atmospheric pressure is 547 deg. C. (Johnston). This is a critical temperature and no combined water is given off until this temperature is reached. The fact that cement when heated may become quick-setting has an important bearing on cement manufacture. When hot clinker is ground, an excessive temperature may easily be reached in the mill. This would tend to make what would, under normal conditions, be cement of the usual setting time become quick-setting.

Numerous instances have come under my observation where quick-setting cement has actually resulted from grinding hot clinker. At one plant where the coolers were shut down for repairs and the clinker was ground so hot that the cement coming from the mills was at a temperature of 400 to 450 deg. F., all the cement was quick-setting. As soon as the coolers were placed in operation again, this temperature dropped to 275

deg. F. and the cement set normally. During the time the coolers were shut down a part of the clinker was stored in a covered storage and ground at a later date after it had fully cooled. The cement then produced from it had a normal set. It was also found that if this cement (ground from the cooled clinker) was heated for one hour at 400 deg. F. it would also become quick-setting.

It is hardly necessary to call attention to the fact that no cement manufacturer can afford to grind red hot clinker. Aside from the chemical reactions which may occur under these conditions, the practice is not economical.

Cement generally leaves the tube mills at a temperature of from 250 to 300 deg. F. It would be interesting to note if the cooling of this cement before it goes into storage would have any beneficial effect on the setting time—particularly when cement shows a tendency to become quick-setting on seasoning. When it is recalled that cement is now generally stored in silos holding from 8,000 to 5,000 bbl. each and that under these conditions, particularly in the summer, the cooling of the cement in the center of one of these silos is a matter of weeks, the possibility of some change in the cement under these conditions does not seem so remote. If cement can be made quick-setting by heating for a few hours at 400 deg. F., the same reaction might occur at a very much lower temperature provided the heating was contained for several weeks.

Effect of Fineness of the Retarder

At one time it was quite frequent to find manufacturers who added plaster to the cement before it was shipped. At such plants the clinker was ground without a retarder. This was then tested before shipment with varying percentages of plaster and the quantity of the latter gaged by the results obtained in such a trial and the setting time desired. Usually this practice was employed only in small works and the mixing was done in the screw conveyors leading from the storage bins to the packers.

There is something in favor of this method of adding the retarder and much against it. In its favor is the likelihood that the desired set can be obtained. Against it is the difficulty of thoroughly mixing the cement and the retarder and the increased cost of plaster over gypsum. Possibly less plaster would be required under these conditions than gypsum added before grinding.

The fineness to which the clinker is ground unquestionably has much to do with the setting time of the cement. This is well understood. The finer the cement, other things being equal, the quicker the setting time. Incidentally the finer the cement the more of it that is active. Naturally, rendering a larger part of the cement active increases also the activity of that portion of the clinker which causes the cement to set quickly. I doubt if a corresponding amount of gypsum is also made active. Gypsum is much softer than clinker, consequently it is much more easily reduced to a very fine powder. If an air analysis of cement is made, the greater part of the gypsum is found in the finest fraction, showing it to be the easier ground of the two. Naturally if the finest portion of the cement is the only portion of the cement which is active and all of the retarder added is needed to take care of this, increasing the finer portion would also require increasing the retarder. This would seem a good argument for changing the specifications and allowing more sulphur trioxide in the cement. It would encourage manufacturers to grind finer. No doubt many plants can get along with the present allowance and grind finer than is usually required, but some, notably those whose raw material are high in alumina, might not. The desirability of this early strength has been noted and fairly high alumina would contribute to this end.

Influence of Chemical Composition

So much for the influence of conditions to which the clinker may be subjected. Unquestionably the composition of the clinker itself has much to do with the setting time of the resulting cement. Theoretically high alumina cements are supposed to be quick-setting and low alumina cements slow-setting. Practically, quick-setting cements can be made from materials relatively high in silica and slow-setting cements from those high in alumina.

It is quite possible to have clinker from which slow-setting cement cannot be made by addition of an amount of gypsum or plaster short of that allowed by the standard specifications. Almost every experienced cement chemist has met with such instances. Popularly, the amount of alumina it contains is supposed to control the setting qualities of the clinker. Unquestionably this does have much influence, but it is not the only factor—probably within the limits ordinarily met with in commercial portland cement, not even the most important one. It is now well understood that improper balancing between the lime and the acid elements—silica, alumina and iron oxide—may cause quick-setting.

Index of Activity

Generally speaking, cements high in alumina are more apt to be quick-setting, other things being equal, than are cements low in alumina. Since silica takes the place of alumina, the reverse of this is true with regard to this element and cement high in silica is apt to be slower setting than cement low in silica. It must be remembered, however, that the actual percentage of silica and alumina is not always an indication of whether the cement may be considered as a high alumina cement or not, the important thing is the ratio between the silica and the alumina. This I have called the "*Index of Activity*" and expressed as follows:

$$\frac{\%\ \text{Silica}}{\%\ \text{Alumina}} = \textit{Index of Activity}$$

In most cements this ratio is from 3 to 4. It is seldom less than 2.5 nor more than 5. Usually if below 2.5 the cement is apt to be quick-setting or to become so on seasoning. Cements with an index of activity of over 5 are hard to burn and very slow setting. They are also slow hardening but show as great ultimate strength as normal cements.

The index of activity of a cement is entirely a matter of the composition of the raw materials employed. Where these are high in alumina the resulting cement will have a low index of activity, etc. My own experience seems to show that under the usual plant conditions an index of activity of from 3 to 4 is most satisfactory. I am by no means disposed, however, to lay this down as a general rule. It is quite probable that by varying other conditions good cements can be made with ratios higher than 4 or lower than 3. In fact, some very good cements do exceed the higher limit and we have special high alumina cements in which the percentage of alumina is several times that of the silica. Nevertheless, for standard portland cement I should prefer to see the index of activity between 3 and 4. When the raw materials are such that the index is less than this, a three-component mix may be employed—a material high in silica taking the part of some of the clay or shale. Sometimes the overburden or "stripping" above the shale or clay is higher in silica than the two latter and may be included when the shale or clay are dug and will so help bring down the alumina. Decomposed sandstone and sandy shale can often be found near the cement plant and these can also be used to reduce the alumina.

There is often the fear that the silica in the latter class of materials being hard will not grind. Sometimes this fear is well grounded, but modern grinding mills are much more efficient than the older types and will generally take care of the small amount of sandy material it is necessary to add to the raw materials in order to bring the index up to 3. The amount is seldom more than 5% of the raw materials. The clinker should, of course, be tested for insoluble silica, for this will show how effectively the mills are grinding the sandy constituent.

This also reminds us that when trouble is experienced with the setting time of cement in which the index of activity is apparently satisfactory, it is well to make a determination of insoluble silica. If this is high, the index of activity indicated by the raito between the total silica and the total alumina as shown by an analysis is only an *apparent* one. The *real* index of activity is the ratio between the *soluble* silica and the *soluble* alumina, since only the soluble elements are in combination with the lime and hence active.

When the index of activity is too high, it is generally much harder to find materials with which to bring up the alumina. Often this high ratio is due to a silicious limestone. Here the amount of clay or shale to be added is usually small, which leaves little room for correction. A material which is sometimes used for bringing up the alumina is boiler ash. Probably only the ash from certain coal can be so employed. Most of our eastern coal, however, gives an ash, relatively speaking, high in alumina. Some blast furnace slag is also high in alumina. Such a slag generally results from the smelting of certain Cuban and South American ores, which are high in alumina. Some fireclays are high in alumina and there is also in Georgia bauxite earth which is an impure aluminum oxide and hence quite high in alumina. All the high alumina materials mentioned can be ground satisfactorily.

Influence of Alkalies

The alkalies probably have some effect on the setting time of cement. Cements burned in the rotary kiln, however, are usually low in alkalies, the latter being volatilized in burning. Most of the European authorities on cement call attention to the fact that cement high in alkalies is quick setting. They are, of course, familiar with clinker burned in shaft and ring kilns. In this country, where practically all cement made in the last 25 years has been burned in rotary kilns, cements high in alkali are unknown. Even when the slurry is made with sea-water, the cement usually contains little, if any, over the normal amount of alkalies, the salt being practically all volatilized in the kiln. It is improbable, therefore, that the alkalies need attention when the setting time of the cement is at fault. Should the alkalies on determination prove high, the burning should be looked into. Possibly in this case the cement is being underburned.

Lime Ratio

As stated, the percentage of lime in the clinker has a marked influence on the setting time. High limed and well burned cements made from finely ground raw materials are slow setting with a moderate amount (1.5%) of SO_3, nor do they usually become quick setting on seasoning (storage). This is particularly true if the index of activity is more than 2.5. Low limed cements are apt to be quick setting or to become quick setting on seasoning, particularly when the index of activity is also low. What percentage of lime it is necessary to carry at any individual works in order to avoid quick setting cement is a question which each mill chemist must find out for himself. The rule laid down below will usually show a *safe* amount of lime, although not the minimum, which, of course, depends on many things.

Most normal American cements contain from 60% to 63.5% of lime. The clinker is, of course, somewhat higher, since the addition of gypsum, which contains only 33% of lime, to the former will reduce the lime. Cement also absorbs water on seasoning. Since the addition of gypsum and the absorption of water lowers the percentages of lime, silica and alumina, it is necessary in comparing the analysis of two cements to take into consideration this fact. For example, clinker containing 64% lime would produce on grinding with 3% gypsum a cement containing 63.2% lime. On seasoning, this cement might easily absorb 1% water and carbon dioxide when it would contain only 62.6% of lime. The analysis of the clinker, fresh cement and seasoned cement under these conditions is given below.

	Clinker	Fresh Cement	Seasoned Cement
Silica	21.42%	20.80%	20.59%
Alumina	7.06	6.85	6.79
Iron oxide	2.38	2.31	2.28
Lime	64.10	63.19	62.57
Magnesia	3.16	3.08	3.04
Sulphur trioxide	0.36	1.69	1.67
Loss on ignition	0.52	1.12	2.10

Instead of comparing two cements, therefore, by means of their analyses, the better way is by means of their respective "Lime Ratios" and "Indexes of Activity." The latter term has been explained previously in this paper. The "Lime Ratio" devised by the writer is the ratio between the lime on the one hand and the silica, iron oxide and alumina on the other, or, expressed as a fraction:

$$\text{Lime Ratio} = \frac{\%\ \text{Lime}}{\%\ \text{Silica} + \%\ \text{Alumina} + \%\ \text{Iron Oxide}}$$

The minimum amount of lime a cement should contain is dependent upon both factory conditions and the index of activity. The maximum of lime is usually controlled by the soundness test. This in turn is influenced to a large degree by the fineness of the raw materials.

Proper Lime Ratio[1]

In my work I have found that unless the cement was abnormally high in alumina (an index of activity of under 2.5) quick setting cement need not be feared where the lime ratio was greater than 2.0. In many instances an even lower lime ratio than this is sufficient. It should be remembered, however, that there is much to be said in favor of a high lime ratio. A high lime ratio gives not only a much more regular setting time, but also gives greater strength and an easier grinding clinker. Cements with a high lime ratio are somewhat harder to burn, considered only from the temperature point, but on the other hand are easier to burn uniformly. Cement with a low lime ratio often becomes sticky, forming rings and balls in the kiln, both of which interfere with uniform and proper burning.

Almost every investigator of the factors influencing the hardness of clinker has confirmed the statement made by the writer years ago, that the higher the lime ratio the easier the cement ground, other factors being equal. This fact is now hence fully recognized. An easily ground clinker means less equipment, power, labor and repairs required to grind; or finer grinding with the same equipment, power, labor and repairs, etc. Generally speaking, it has meant finer cement and consequently greater strength.

At the same fineness, however, cements with a high lime ratio show greater strength than do cements with low lime ratios, etc. This is natural. The higher the lime ratio, other things being equal and free lime being absent, the more tri-calcium silicate is present. Practically all investigators seem to feel that this is the most desirable constituent in cement, the other two being chiefly the di-calcium silicate and the tri-calcium aluminate. To show how a small variation in the lime ratio will affect the quantity of tri-calcium silicate present the analyses below are submitted:

EFFECTS OF VARIATION IN LIME RATIOS ON THE COMPOSITION OF CEMENTS

Analysis	*A*	*B*
Silica	22.86%	21.14%
Alumina	7.52	6.94
Iron oxide	2.50	2.30
Lime	61.20	63.24
Magnesia	3.05	3.26
Sulphur trioxide	1.56	1.20
Ratio		
Index of activity	3.06	3.06
Lime ratio	1.86	2.07
*Probable Composition**		
Tri-calcium silicate	22.6	56.62
Di-calcium silicate	49.2	20.13
Tri-calcium aluminate	19.9	18.74

*In making the above calculations as to the probable composition of the two cements allowance has, of course, been made for the iron oxide, free lime, inoluble silica, magnesia and sulphur trioxide. (See *Concrete*, Mill Section, July and August, 1927.)

It will be noted that in spite of a difference of only 2% of lime between the two cements, *B*, the one highest in lime, has over twice as much of the most valuable constituent, tri-calcium silicate, as the cement *A*, low in lime. In this particular comparison, the cement *B* had an initial set of over two hours and the cement *A* an initial set of two minutes.

Desirability of Uniform Composition

It is particularly desirable that the clinker be of *uniform* chemical composition. It often happens that a clinker low in lime mixed with clinker high in lime will give a cement of apparently satisfactory chemical composition, due to averaging, and yet the material low in lime will have sufficient influence to make the cement quick-setting. By grinding such a mixture of clinker we sometimes encounter the seeming paradox of a quick setting, unsound cement.

In studying the behavior of a cement we must always consider whether the clinker was of uniform composition or a mixture of different kinds of clinker. Naturally, of two cements having the same chemical composi-

[1]Refer also to Rock Products, August 21, 1926, page 61.

tion, the one ground from a clinker of uniform composition would have very different properties from one made of clinker of varying composition, as explained above.

The remedy for unsoundness is usually finer grinding of the raw materials. Faulty composition or underburning are readily detected. When the product of a cement mill tends to unsoundness, it is quite frequent to find the chemist lowering his lime content in an effort to make the product pass the steam test. Not infrequently this is attended with quick setting cement. Sometimes the cement has a normal set when freshly ground, but becomes quick setting on storage. The remedy for unsoundness here must be found elsewhere. Usually it will be found that finer grinding of the raw material or a more regular mix or a more careful inspection of the burning will be the remedy for the trouble. I mention this particularly, because in many instances when I have investigated trouble with quick setting cement, the trouble has been caused primarily by what I call an "unsoundness complex"—the fear that the product will fail to pass the steam test.

Workability of Concrete

A SUMMARY of the study of the methods for measuring the workability of concrete which has been conducted at the U. S. Bureau of Standards was presented at the convention of the American Concrete Institute at Philadelphia, February 28 to March 1.

The plastic properties of neat cement pastes were first studied by measurements of the velocity of a ball pulled through the paste. This apparatus gave data of interest but could not be applied to the study of the workability of concrete. Next, a study of the separation of the concrete on the flow table was made. After flowing the concrete was divided into two equal areas by two concentric circular cutters. The volume and weight of aggregate coarser than the No. 4 sieve in each portion were measured, and the workability figure calculated as a function of these measurements. Several shapes of flow table and heights of drop were used. There was an indication that the best results were obtained with the flat top table operated with a 1/16-in. drop. This method was not, however, found completely satisfactory since the influence of mixing time could not be determined. The next method which was used measured the internal resistance to shear of the concrete by the deformable cylinder, as described in *Technical News Bulletin* No. 114, October, 1926. The results obtained with this method were encouraging but did not show a marked difference in workability of lean concrete mixes. The final study was made with a modification of the Pearson and Hitchcock penetration rod apparatus. This apparatus was modified by making each drop of the weight a constant and then by increasing the number of rods from 1 to 3. This apparatus has given the most satisfactory index of workability thus far obtained.

The principal results obtained from the tests may be summarized as follows:

1. The workability as determined by the separation of the concrete on the flow table was not satisfactory for several reasons. The individual measurements varied too greatly, the measurements on mixes of different proportions did not show markedly different results and the personal element also entered too markedly into the tests.

2. The deforming cylinder apparatus did not measure the workability of lean mixes of different proportions distinctly and conclusively, nor was the test sensitive enough to measure the effect of increase in the mixing time upon the workability.

3. The modification of the penetration rod apparatus by driving in the rod by a falling weight instead of by the inertia of the rod when the whole apparatus was dropped has eliminated the compacting of the aggregates and, together with lightening the rods and driving weight, using three rods instead of one, and the use of a larger mold, has increased the precision of the tests. This apparatus is capable of measuring the influence of increased mixing time upon the workability and measures the difference in workability of lean mixes with different gradations.—*Technical News Bulletin.*

"True" Density of Several Limestones Used in the Manufacture of Lime

IN AN INVESTIGATION at the U. S. Bureau of Standards on improvement in the manufacture of lime products it has been found necessary to make a study of some of the physical properties of several limestones. The properties considered were density, porosity and crystal size. The careful determination of these properties, it is hoped, may, on completion of the work, give some index as to the optimum conditions to be imposed upon stone of different types in order to yield the most satisfactory products.

Density determinations have been made on 12 samples of stone, and in view of the limited amount of data of this nature available the results are herewith presented. The methods used were as follows: The rock samples were reduced to pass a No. 200 sieve. A weighed portion of the ground sample was placed in a calibrated picnometer which was then evacuated to a pressure of 10 mm. of mercury for two hours. While the picnometer was still evacuated kerosene was added until the sample was submerged in that liquid. The picnometer was then filled to the calibration mark with kerosene at 25 deg. C. and weighed. The density of the kerosene was determined both under atmospheric conditions and for a period of one-half hour in vacuuo. No appreciable difference was observed in the kerosene density under the two conditions. The above procedure was, therefore, considered sufficiently accurate, especially in view of the fact that the kerosene was exposed to vacuum over the sample for only two to five minutes.

The following table gives the results obtained:

Sample No.	Type	Locality	"True" density
1	High Ca	Missouri	2.788
2	High Ca	Virginia	2.760
3	High Ca	Ohio	2.772
4	High Ca	West Virginia	2.795
5	High Ca	West Virginia	2.759
6	Mg	Ohio	2.858
7			
8	Mg	Maine	2.882
9	High Ca	Washington	2.561
10	Dolo	Ohio	2.694
11	Dolo	Ohio	2.383
12	Mg	Pennsylvania	2.844
13	High Ca	Vermont	2.877

—*Technical News Bulletin.*

Canadian Exports of Asbestos for January

THE exports of Canadian asbestos in January, 1928, show a marked decrease from those of December, according to a report recently issued by the Canadian Bureau of Statistics at Ottawa. The report shows that the January exports amounted to 8290 tons valued at $589,126, while the December exports were 11,401 tons valued at $808,040. The average value per ton in January was $71, and the average for December was slightly less than that, indicating that either a higher grade product entered more extensively into the January trading or that there was a general increase in the price for all grades. Comparing the figures for January, 1927, with the exports for January of this year, it is noted that the amount reached 8964 tons for the month a year ago, or 674 tons more than for January, 1928. The value, however, was slightly lower, being $575,657, or an average of only $64 for January, 1927.

It is noted that for the year ending January 31, 1928, there was a decline of nearly 7000 tons in the exports of asbestos, which totaled 132,551 tons, as against 139,541 tons for the year ending January 31, 1927. This decrease was more than offset by the higher average prices, the value being $8,710,845 for the year ending January, 1928, as against $8,582,329 for the previous year.

The United States was the largest customer during January, 1928, receiving 4782 tons of Canada's asbestos exports. Japan took 1090 tons of the product, and Germany was third, importing 803 tons. France received 755 tons and the United Kingdom took 445 tons. The balance of the month's exports were distributed between Australia, Belgium, Italy and the Netherlands. In addition to asbestos itself, exports in January included 807 tons of asbestos sand and waste, valued at $137,910, most of which went to the United States.

Carl D. Bradley

CARL D. BRADLEY, one of the organizers and president of the largest single quarry operation in the world—the Michigan Limestone and Chemical Co., Rogers City, Mich., died March 20 in Pasadena, Calif., whither he had gone in search of rest and health. He was in his 69th year. The following obituary from the *Cleveland Plain Dealer* gives a resumé of his entrance and career in the quarry industry.

"One of the best known men on the Great Lakes, he started a development of limestone quarries at Calcite, Mich., about 16 years ago, which stand today as the greatest on the Great Lakes, and probably in the world. Mr. Bradley had been working for an engineering firm in New York, which specialized in opening new industries.

"Mr. Bradley was sent to Calcite to make a survey. His report on what he found resulted in opening the quarries which now supply stone for the steel industry, because of its fine flux, this same stone also is the basic principal for most of the alkali used in making soaps, it is used for the manufacture of fertilizer, road making and cement.

"His big problem was to quickly market this raw material. To this end he early studied the best method of handling his product in shipment. To expedite the quick handling necessary he invented and perfected the self-unloading boat, which is now used on the Great Lakes for other purposes than on boats carrying stone cargoes. The 'Carl D. Bradley,' the last boat built for the Bradley Transportation Co., is the last word in vessel construction for the handling of stone.

"She was built primarily to carry stone to the big cement plant at Buffington. She is not only the largest stone-carrying vessel on the Great Lakes but holds several records for cargoes transported.

"But Mr. Bradley, according to those who knew him best, not only developed his business, but also contributed much to the community which he practically founded. He was a power in civic affairs and it is said that no man ever had more continuous loyalty from his employes. Many of the men now in his employ began with him sixteen years ago.

"A successful business man, he was not concerned about money, for money's sake, it is said. He wanted to make his business a success and the best of its kind. In that he sought and got the co-operation of his employes. His was the open door policy and any employe was always welcome in his office.

"He was a man of tremendous energy and great affability. Cleveland vessel operators yesterday were unanimous in paying high tribute to Mr. Bradley's fine character and the impress he had made in lake shipping, although in the business for a comparatively few years.

"He is survived by his widow and two sons, A. Ballard Bradley, Chicago business man, and Fred V. Bradley, associated with his father in the transportation company."

His funeral was held in Chicago on March 26, attended by prominent business men in many lines.

New York City to Have Big New Trap Rock Organization

THE STANDARD TRAP ROCK CORP., New York City, has let a contract to the Allis-Chalmers Manufacturing Co. for a complete crushing plant, consisting of an 84 by 60-in. primary jaw crusher with No. 12 type "C" crushers and 10-in. Superior McCully reduction crushers for the secondary crushing. The plant will include six 72-in. and three 60-in. screens. The equipment will be electrically driven and the contract includes all motors and transformers.

Big Sand Dredging Operation in Georgia Planned

THE state of Georgia is primarily interested in the formation of a company to be known as the Chattahoochee Sand and Gravel Co., since there is a proposed royalty of 5 cents per cubic yard for sand which the company purposes taking from the Chattahoochee river, in dredging that river from Columbus toward Atlanta. The plan of the company, it is understood, contemplates the construction of a washing and screening plant probably in the vicinity of Columbus, Ga., to cost in the neighborhood of $250,000, and later the location of a second plant of that nature higher up the river, as the work of dredging goes on.

For the past two or three weeks negotiations have been going on between representatives of the proposed company, the governor's office, to determine whether or not the governor has the authority to make the lease to the river rights, or whether that would have to be done by legislative enactment through a special board or commission to be named by the legislature.

During the past week a personal survey of the stretch of river to be covered was made, and incidentally, officials of the new company were taken to the Nacoochee valley section and shown large land holdings of Governor Hardman, on which there are valuable sand deposits.

The company negotiating with the state of Georgia also has been in negotiation with the state of Alabama, and is understood to have made a contract with that state to pay it a royalty on material taken from the Chattahoochee river on the Alabama side. Georgia, however, is making an investigation of that phase of the situation, in the light of old records which show that the entire Chattahoochee river is in the state of Georgia, up to the highwater line on the Alabama side of the river.

The same company already is engaged in dredging work in Florida on the Appalachicola river, which joins with the Chattahoochee.

The material to be taken from the rivers by dredging, it is understood, is to be used for general construction and road building purposes and the company contemplates paying a designated royalty for all sand and material removed from the river.

The company is said to have closed contracts already for the establishment of gravel plants in both White and Floyd counties, at a cost of about $300,000 for the two.—*Augusta* (Ga.) *Chronicle.*

R. Keith Compton To Be President of Road Builders

COL. R. KEITH COMPTON, of Richmond, Va., will become president of the American Road Builders' Association at the annual meeting of the organization to be held in Washington on May 11. Col. Compton was elected during the convention of the association, held in Cleveland during January. More than 25,000 persons attended the convention. He will succeed Charles M. Babcock, chairman of the Minnesota State Highway Commission, whose term expires.

Col. Compton, the president-elect, is director of public works of Richmond. He served as an officer in the World War and has since gained national reputation for his engineering accomplishments. He will take office at the road builders' banquet, to be held in Washington on the evening of May 11.

A new vice-president will be installed for the southern district of the association. He is D. B. Dimick, of Birmingham, Ala. The other new officials to be installed are S. M. Williams, of Washington, and W. R. Neel, of Atlanta, who will become directors.

Columbia River Sand Royalty Fixed at 5 Cents

OFFICIALS of the land departments of the states of Oregon and Washington, at a meeting in Salem, Ore., March 9, fixed 5 cents a cubic yard as royalty, effective immediately, for sand taken from the Columbia river in the future.

The price of 5 cents a cubic yard was fixed after the officials had received reports that the demand for sand is limited, and that a number of sand and gravel operators have conducted their plants at a loss during the last few months. The royalty on sand taken from navigable streams within the state of Oregon is 10 cents a cubic yard.

The officials have not yet fixed the royalty to be demanded for sand taken from the Columbia river in the past.—*Portland* (Ore.) *Oregonian.*

Hints and Helps for Superintendents

Neat Form of Rinsing Chute

RINSING CHUTES for both gravel and stone plants are becoming so commonly in use that they hardly class as "hints" for this department. The picture given, however, shows a rather neat arrangement of

Rinsing chute enclosed to prevent slopping of water

such sluices, although the photograph does not give the details very clearly.

The chute comes from the gate and the sides are enclosed so that no water can splash out. Water is brought in by a pipe above, which is not shown, and it is carried to the usual spray pipes above the screen over which the gravel passes to the truck. The water passing through the screen is caught in a chute parallel with the screen that discharges into the waste flume that shows clearly in the picture. As everything is enclosed, or boxed in, there is no slop or spill. The ground underneath the bins was dryer than the ground outside when the picture was taken. The puddles that show in the picture came from a rain that fell a short time before the picture was taken.

Quarry and Industrial Railroad Tracks

By W. L. HOME
Mining Engineer, Pine Plains, N. Y.

SOMETIMES quarry superintendents are blessed by having a first-class track foreman who knows his business so details of laying and maintaining track can be left almost entirely to him. On the other hand, often enough, this work is a job that men are put on at times when you know the track needs working on and you happen to have a crew idle from some other kind of work. Perhaps they are track men and perhaps not.

It makes but little difference whether steam, gas, or electric locomotives are used if your track is not first-class your haulage costs and maintenance to both track and haulage equipment will be high. The first requisite of cheap haulage is a first-class road bed with a minimum of grades and curves and a track on the road bed properly put down. We all know these things and there is nothing new about it. The railroad companies spend enormous sums to eliminate a small grade and properly to maintain track. With the railroads it is an engineering problem and handled as such. If the results did not warrant the expenditures in future economies to meet growing competition the railroads would not spend the money. Quarries cannot always afford to spend much money on tracks but by closer supervision and by not being satisfied if the cars stay on the track, quarry tracks might be better.

We will assume that the grades and bumps are eliminated as much as possible and that the steel is good. All of this can be judged fairly closely by the eye and is so absolutely essential that it is usually taken care of. One of the worst evils and the least noticed is wide gauge. If the cars stay on the track this is rarely noticed. However, the troubles from this source are usually blamed to something else and the gauge remains as wide as ever. Wide gauge allows the engine to go from side to side and with a big swing, hammer the rails with all its might while the rails retaliate by resisting the blow from this side swing thereby striking back. The damage at one time amounts to nothing but this steady hammering tears up both the track and the haulage equipment where if proper gauge were used this would not happen.

Check up on track gauges and some of you will be surprised. Standard wheel gauge is 4 ft. 8¼ in. The wheels are pressed on the axles to 4 ft. 8 in. This gauge then allows but ¼-in. of play which may be a little tight for quarry work but the maximum should not be over 4 ft. 8½ in. on the tangents and 4 ft. 9 in. on the curves. Around curves the outer rail should be elevated ½-in. for about each degree of angle (100 ft. chords) of the curve. This will be efficient for as high speeds as are ever needed around a quarry.

Simple Forge for Melting Babbitt

A SIMPLE heater or forge for melting babbitt and for similar uses around the plant may be made of an old bucket from a large-size bucket elevator. A plate is bolted to each end of the bucket for the heater to stand on, in such position that the point of the "V" will be downward, as shown in the illustration. Then an iron pipe for draft is passed through the forge from end to end, with holes in it at intervals to permit the exit of air. The outfit can easily be carried from place to place in the plant and hooked up wherever there is an airline to furnish the draft. To provide a greater space for

Forge for melting babbitt made from parts of old bucket elevator

the fire, iron plates can be laid in the sides of the bucket, extending them upward, as shown. This heater was devised at the Riverside Lime and Stone Co., Lyons, Ill., where it is found to be very handy and convenient.

Combating Free Lime in Cement Clinker with Petrographic Microscope

By L. N. BRYANT
Chief Chemist, Basic Products Co., Kenova, W. Va.

FREE OR UNCOMBINED lime is one of, if not the greatest evil in portland cement clinker. One prominent author claims that cement which has been seasoned sound is just as good as one which was sound when freshly made. This, in the writer's opinion is entirely erroneous. A cement containing 1% of uncombined but hydrated lime is just that much weaker as to bonding properties, than a cement of the same lime content, but containing no uncombined lime. The ultimate strength limit of portland cement is reached at the point of composition where free lime first appears in the clinker.

Many chemists have been puzzled as to why their cement theoretically contains no excess of lime, apparently is well burned and sound, yet has but a small gain, and possibly a retrogression between the 7- and 28-day strength periods. This, in most cases, without a doubt is due to the free lime which is not in sufficient quantity to cause the cement to fail in the soundness test. Scientific research and practice have found that cement may pass the usual soundness tests and yet contain much free lime.

The higher the lime content can be carried without the occurrence of free lime, the higher the early and ultimate strength of the resulting cement, and the problem before the chemist is, at what point can he carry the lime to suit the varying operating conditions and obtain this higher strength. The lime limit will vary at different mills, due to the various conditions existing, such as, the fineness of the raw materials, the flux content, and the temperature of burning. With one or more of these conditions varying, the chemist is at a loss as to just where this maximum limit can be established and, as the usual methods for determining free lime by solution are long and uncertain, the problem offers great difficulties for mill control work.

The method of Prof. Alfred D. White (*J. Ind. and Eng. Chem.*, Jan., 1909), using a solution of nitro-benzol-phenol and a petrographic microscope, as given in the 1926 edition of "Portland Cement," by Richard K. Meade, is the only known method suitable for mill control at the present time. The writer has used this method successfully for estimating the free lime in fresh clinker, the method being valueless for this determination on aged cement or clinker however, due to the fact that there is no discrimination between the oxide and the hydrate.

L. N. Bryant in the laboratory of the Basic Products Co., Kenova, W. Va.

The results obtained by this method are empirical, but with a little practice, different operators can obtain the same results. The method of estimating the amounts of free lime found may be classified as follows—none, trace-few, many, and very many. At very many, the clinker invariably was found to be unsound. To count or measure the free lime crystals would be nearly impossible, and such a classification as the above is very satisfactory for mill control.

After an extended period of observations of the various conditions occurring as to the fineness of the raw materials, the flux content, the temperature of burning, and the free lime content of the resulting clinker, the writer constructed the chart below which is used by him successfully in mill control.

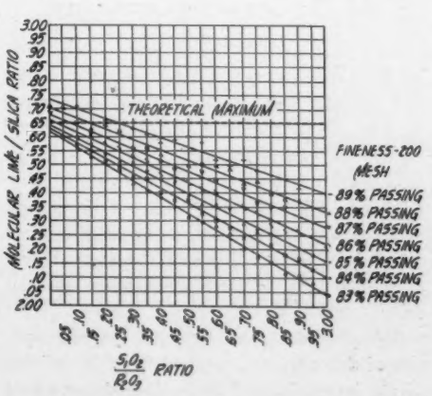


Chart used for mill control of free lime in cement clinker

The lime content was measured by means of the molecular lime silica ratio, calculated as follows:

$$\frac{CaO\times 1.07-(Al_2O_3\times 1.65+Fe_2O_3\times 0.7+SO_3\times 0.7)}{SiO_2}=\text{Ratio}$$

The flux content was measured by means of the silica divided by R_2O_3 ratio.

By plotting the point of the first appearance of free lime on the lime-flux intersection of a given clinker, and noting the fineness of the raw material, it will be found that the lime may be varied higher or lower as the flux and the fineness vary. By plotting a number of such points with the same fineness, but varying composition, a well defined curve may be found for that fineness.

By using such a chart and making free lime determinations at frequent intervals, the chemist will know in short order if the kiln is doing its work properly, and, should free lime be found, the necessary correction can be made at the kiln, resulting in a more uniform, and what is most important, a higher ultimate strength cement.

Cash Value of Safety

IN 1925, we had 20 lost-time cases, which resulted in 163 days of lost-time at a cost of $1.13 per hundred dollars of payroll.

In the first three months of 1926, we had 11 lost-time accidents and 54 days of lost-time at a cost of 5 cents per hundred dollars.

Since March 31, 1926, we have only had one lost-time case with 16 days of lost-time at a cost of 1.26 cents per hundred dollars.

This improvement we attribute to:

First: Creation of interest.

Second: Steady maintenance of interest.

Third: Prompt reporting of injuries, thus permitting first-aid in time.—W. P. SABIN, secretary, Ash Grove Lime and Cement Co., at the National Safety Congress.

Merger of Ottawa Silica Sand Companies Contemplated

THE first step in what may become a complete merging of many crude silica sand properties in the Ottawa, Ill., district was taken by the American Silica Corp. on March 9 in obtaining permission from the Chicago Stock Exchange to list $1,000,000 in bonds with the exchange. If the contemplated merger is effected it will give the American Silica Corp. control of practically all of the developed crude sand properties in the Ottawa territory and much acreage of virgin sand land.

R. J. Beatty, of Chicago, president of the Ottawa Silica Moulding Sand Co., of Chicago, and formerly with the Inland Steel Co., is to be president of the merged company, whose headquarters will be in Ottawa, according to the report. Beatty became interested in molding sand through his connection with the Ottawa Silica Moulding Sand Co., which operates at the eastern end of Buffalo Rock, near Ottawa.

It is said that among the companies to join in the consolidation are the American Silica Co., E. J. Reynolds Sand Co., Fire Sand Co., Higby Canyon Sand Co., F. C. Rose Sand Co., Illinois Valley Silica Co., Ottawa Silica Moulding Sand Co., Benson & Richards Sand Co., Buffalo Rock Silica Co., South Ottawa Silica Co., and the Wilgen estate, Fred Schorer, Jr., Elda Smith, Crane Co. and Frank Vallett properties, all of Ottawa; the E. L. Whitmore Sand Co. of Melrose Park, the C. W. Wilkerson Sand Co. of Wedron, Ill., and the Federal Mines at Utica. If the merger becomes a reality, it is believed the company will operate only such pits as will be necessary to meet the production demand.

George Gleim, of the law firm of Gleim and Colwell and Roger Clark, of Ottawa, have represented the American company at Ottawa. The American company is incorporated under the laws of Illinois.—*La Salle* (Ill.) *Tribune.*

Pioneer Gravel Expands Ready-Mixed Concrete Business at Seattle

THE Pioneer Sand & Gravel So., Seattle, Wash., through D. L. Williams, vice-president and general manager, has announced plans for the expansion of its Tru-Mix Concrete Plants in this city. Mr. Williams stated that equipment for a complete new plant unit at Westlake Avenue North and Roy street, had been ordered. A 2 cu. yd. mixer, with the new water measuring and timing devices, will be installed, and precision scales for scientific aggregate measurement will form part of the plant. This unit, in addition to the present 1-yd. unit in use of about 750 cu. yd. of mixed concrete. Mr. Williams also states that improvements are also being made to the plant at Spokane street and East waterway, that will raise production.

With these additions and improvements, the combined Pioneer Tru-Mix Plant capacity will be about 1,000 cu. yd. per day.

In discussing the growth of Tru-Mix business, Mr. Williams said "During the months of January and February of this year, sales volume has been 26% higher than the monthly average for 1927, and more than double the volume for the corresponding period of 1927. In the past, Tru-Mix Concrete has demonstrated its adaptability and economy on every class of concrete construction. The expansion of our plants, is an effort to maintain and improve our high standards of service and is an expression of confidence in the progressiveness of Seattle Builders."—*Seattle* (Wash.) *Journal of Commerce.*

East Central Territory Expects Expansion in Business

BETTER BUSINESS in general and in the iron and steel industry in particular in the territory of the Allegheny Regional Advisory Board, embracing the most important steel producing centers of Pittsburgh, Youngstown and the Ohio Valley, for the second quarter of the year is forecast in the quarterly survey of the organization reported at a meeting held recently in Pittsburgh.

While the shippers of the territory expect 8.3% larger car requirements to move their products in all industries as compared with the second quarter a year ago, the iron and steel industry expects an increase of 3%.

All of the basic industries, including cement, clay, brick, sand and gravel, which are also produced in the immediate Youngstown territory, indicate increases.

Clay, gravel, sand and stone, 7.8% increase; cement, 10.8% increase; brick and clay products, 3% increase; lime, 12% increase.—*Youngstown* (Ohio) *Vindicator.*

U. S. Gypsum Company Expanding

ESTABLISHMENT of an important new industry for New England is assured by the sale by the Boston & Maine Railroad of 5¼ acres of deepwater harbor frontage in Charlestown to the United States Gypsum Co., Chicago, Ill. This company will soon begin erection of a $1,500,000 plant which will employ 300 to 500 men and produce 1000 tons of fireproof building material daily.

Bringing into New England the manufacture of this material resulted from the efforts of the industrial and real estate departments of the Boston & Maine. The United States Gypsum Co., its officers say, was influenced in the decision by a notable increase in New England's importance as a market for fireproof building materials and a belief that this section generally soon is destined to show marked growth in building construction.

The tract is on the south side of the main channel of the Mystic river, near the Mystic terminal docks of the railroad. The frontage on the channel, here 30 ft. deep, is 409 ft. There is a right of way to the Chelsea viaduct. The tract formerly was occupied for years by the Philadelphia & Reading Coal and Iron Co.

The plant to be erected will cover 4 acres and has 10 or 12 buildings of the latest first-class fireproof type. New dock facilities to enable the Gypsum company with its own steamers to deliver raw gypsum from its quarries in Nova Scotia and New Brunswick direct to the plant, will be built.

The company has 25 plants elsewhere in the United States and employs 20,000 persons. At the Charlestown plant, which will be in operation within a year, it will make gypsum wallboard, partition tiling, wall plaster, high-grade molding and specialty plasters for direct shipment to New England consumers.

Though title was taken only recently, the company had engineering representatives on the ground to study construction problems within 24 hours.—*Boston* (Mass.) *Transcript.*

At Port Clinton, Ohio, the U. S. Gypsum Co. is reported to have expanded its holdings of gypsum property by the purchase of 77 acres of the Ben Shook farm, Portage township.

A report from Blue Rapids, Kan., states the U. S. Gypsum Co. will close its plant there, temporarily at least, and provide products from other points where manufacturing costs are less.

Gen. Marshall Resigns as General Manager of A. G. C.

THE construction industry soon will see a change in its leadership when Gen. R. C. Marshall, Jr., resigns as general manager of the Associated General Contractors of America, a position which he has held for eight years and in which he will be succeeded by D. A. Garber, of New York, one of the best known construction men in the United States, who was the first president of the contractors' organization, which he helped to found. The change will take place May 1.

Gen. Marshall is resigning from his position as executive head of the A. G. C. to become president of the Sumner Sollitt Co., Chicago. His new affiliation will link him with a construction organization which is among the largest in the country and which has operated in England and in this country for five generations.

Mr. Garber, in making the change, severs his connections with the North-Eastern Construction Co., New York, of which he has been president since 1904 and which has engaged in many major projects in states along the Atlantic seaboard.

Editorial Comment

Let There Be Light!

Our March 17 issue contained an abstract of a report by F. H. Jackson, engineer, U. S. Bureau of Public Roads, on some comparative tests of gravel and trap-rock concrete. Probably a large proportion of ROCK PRODUCTS readers in both the quarry and gravel industries were sufficiently interested to get a copy of the complete report. In the case of the gravel industry the National Sand and Gravel Association is furnishing this in its March *Bulletin*. We presume the National Crushed Stone Association will do the same for its industry.

In this issue of ROCK PRODUCTS we publish an abstract of Stanton Walker's (chief of the engineering division of the National Sand and Gravel Association) interpretation of these tests. In a later issue we presume we shall have an opportunity to publish an abstract of an interpretation by A. T. Goldbeck (chief of the engineering division of the National Crushed Stone Association).

All of these discussions shed *light* on the theory and practice of engineering in design and use of concrete. They will help eventually to bring order out of chaos; to help formulate rules or formulas which will give the purchaser the most for the money expended. That is the ultimate goal of all engineering and scientific research, experiment and experience. "He profits most who serves best" and he only succeeds in the long run who fits into the ultimate economy of things.

This investigation of the U. S. Bureau of Public Roads did not (and all similar investigations will not) prove that all aggregate of one type is better than all aggregate of another type under all conditions. Every aggregate, including slag and burned clay, has peculiar advantages as well as disadvantages for particular purposes. It is the problem of the engineer to definite those advantages and disadvantages in unquestionable terms. When that is done, all will be happier and competition will be cleaner and more intelligent; and the designer and user of concrete can proceed with more assurance and less risk. Knowledge is power, power to grow and develop along sound lines.

Dust Collection a Live Subject

Quite recently a ROCK PRODUCTS editor has visited a number of research men in the rock products industries and has also visited some of the makers of dust-collecting apparatus. He finds that there is the liveliest interest in the subject of dusts, that potential users of dust collectors are anxious to hear of any improvements being made and that manufacturers of these devices are all working on newer forms which will apply some of our recently gained knowledge of dusts and dust clouds. A few years ago there was a pretty general ignorance of the work of Gibbs, Cohen and other investigators of dusts, even among those whose business it is to keep in touch with such matters, but today when such work is mentioned the hearer not only knows of it but is anxious to learn if anything new has been developed by such men.

Gradually we are accumulating a body of real information concerning industrial dusts, using the word in the general and not the limited sense. We can classify such dusts and weigh and measure them even where the separate particles are microscopically small. It is no longer a miracle that particles of substances weighing a thousand times as much as air will float in air almost indefinitely. We are beginning to understand something of the parts played by surface tension, adsorbtion of gases and electrical charges in the formation of dust clouds, and the sustaining of dusts that do not form true clouds, in the air. Some of this knowledge has already been very successfully applied to the collection of dusts, but more of it will be applied within a short time.

Every dust collector manufacturer called upon admitted that he had something new that he was trying to work out, and some of them went further and explained the theoretical principles with which they were working. The information they gave was confidential, of course, but it is violating no confidence to say that some of the methods proposed and the results obtained in tests are rather startling.

Going along with the study of collecting dusts is the study of what to do with the dusts when they are collected. The problem of returning cement dust to the kilns, for example, does not appear to be solved for every case, but great progress is being made, and in individual cases it has been satisfactorily solved. The transportation of dusts is one of the newer triumphs of engineering but something still remains to be learned about this phase of the dust problem.

A summing up of the impressions gained is that there is the greatest interest in the study of dusts and dust collection; that inventors and research men are working along some new lines, and that men in the control of business recognize that dust is more than a nuisance or even a loss of good material, and that its collection will pay in lessened repairs, increased plant efficiency, lessened labor turnover and other indirect but very profitable ways. Plant "good housekeeping" is perhaps a byproduct of accident prevention, but it is now assuming all the importance of a major objective in plant management; and freedom from dust is certainly a prime essential.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. com.[37]	12-30-27	3	7	
Allentown P. C. 1st 6's[37]	12- 5-27	90	92	
Alpha P. C. new com.	3-23-28	37	40	75c qu. Apr. 14
Alpha P. C. pfd.	3-23-28	116	.....	1¾% qu. June 15
Am. L. & S. 1st 7's[22]	2-24-28	101¾	102½	
Arundel Corp. new com.	3-29-28	46¾	47¾	50c qu. Apr. 2
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	3-27-28	109	112	
Atlas P. C. com.[5]	3-23-28	41	43	50c qu. Mar. 1
Atlas P. C. pfd.	3-23-28	44	.....	66⅔c qu. Apr. 2
Beaver P. C. 1st 7's	7-29-27	100	100	
Bessemer L. & C. Class A[4]	3-28-28	36	37	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	2-24-28	100¼	.....	
Boston S. & G. com.	3-28-28	74¼	80	$1 qu., $1 x. Jan. 2
Boston S. & G. pfd.	2-24-28	80	85	1¾% qu. Jan. 1
Boston S. & G. 1st pfd.	2-24-28	90	95	2% qu. Jan. 1
Canada Cement com.	3-23-28	31¾	32	
Canada Cement pfd.	3-23-28	99¾	100	1.62½ qu. Mar. 31
Canada Cement 5½'s	2-21-28	102¾	.....	
Canada Cr. St. Corp. 1st 6's	3-24-28	97	100	
Chas. Warner com.	3-23-28	36	39	50c qu. Apr. 10
Chas. Warner pfd.	3-23-28	108	.....	1¾% qu. Jan. 26
Cleveland Stone new st'k	3-28-28	77	80	50 qu. June 1
Consol. Cement 1st 6½'s, A[42]	3-28-28	96	99	
Consol. Cement 6½ notes[24]	3-27-28	94	98	
Consol. Cement pfd.[41]	3-27-28	50	65	
Consumers Rock & Gravel 1st 7's[18]	3-23-28	99½	101½	
Coosa P. C. 1st 6's[32]	12-28-27	65	75	
Coplay Cem. Mfg. 1st 6's[40]	3-23-28	90	.....	
Coplay Cem. Com.[40]	3-23-28	12½	.....	
Coplay Cem. pfd.[40]	3-23-28	72½	.....	
Dewey P. C. 1st 6's[30]	3-27-28	99	101	
Dolese & Shepard[1]	3-27-28	150	160	$2 Apr. 1, $1.50 ex. Apr. 1
Edison P. C. com.[39]	2-24-28	50c	.....	
Edison P. C. pfd.[39]	2-24-28	1	.....	
Edison P. C. bonds[39]	2-24-28	75	.....	
Fredonia P. C. 1st 6½'s[32]	12-28-27	97	101	
Giant P. C. com.	3-23-28	30	40	
Giant P. C. pfd.	3-27-28	35	45	3½% Dec. 15
Ideal Cement com.	3-28-28	115	.....	$1 qu. Apr. 2
Ideal Cement pfd.[33]	3-26-28	110	112	$1.75 qu. Apr. 2
International Cem. com.	3-28-28	68⅛	68¾	$1 qu. Mar. 30
International Cem. pfd.	3-28-28	109	111	1¾% qu. Mar. 30
Kelley Is. L. & T. new st'k	3-28-28	51	55	62½c qu. Apr. 2
Lawrence P. C.[2]	3-23-28	107	111	1½% qu.
Lehigh P. C.	3-23-28	54	56	62½c qu. Jan. 1
Lehigh P. C. pfd.	3-26-28	108	109½	
Lyman-Richey S. & G. 1st 6's, 1931[13]	8-12-27	99½	100	
Lyman Richey S. & G. 1st 6's, 1935[13]	8-12-27	97½	99	
Marblehead Lime 1st 7's[14]	3-24-28	100	.....	
Marbleh'd Lime 5½'s, notes[14]	3-24-28	98	.....	
Mich. L. & C. com.	3-26-28	40	.....	
Mich. L. & C. pfd.	3-26-28	25	26½	1¾% qu. July 15
Missouri P. C.	3-28-28	43	43½	50c Feb. 1
Monolith P. C. com.[9]	3-22-28	15½	16	8% ann. Jan. 2
Monolith P. C. pfd.[9]	3-22-28	9½	9¾	
Monolith P. C. units[9]	3-22-28	34½	35½	
National Cement 1st 7's[38]	3-24-28	96	99	
National Gypsum com.[35]	3-27-28	16	18	
National Gypsum pfd.[35]	3-27-28	65	70	1¾% qu. Apr. 1
Nazareth Cem.[20]	3-23-28	31½	33	75c qu. Apr. 1
Newaygo P. C.[1]	12-30-27	115	.....	
Newaygo P. C. 1st 6½'s[23]	2-11-28	120	.....	
New Eng. Lime pfd., A[14]	3-24-28	.....	95	
New Eng. Lime pfd., B[22]	3-23-28	96	98	
New Eng. Lime, V.T.C.[22]	3-23-28	34	36	
New Eng. Lime 1st 6's[14]	3-24-28	98	100	
N. Y. Trap Rock 1st 6's[33]	3-28-28	101¾	101¼	
North Amer. Cem. 1st 6½'s	3-28-28	90	90	
North Amer. Cem. units[19]	3-27-28	50	56	2 mo. per. at 7%
North Amer. Cem. com.[19]	3-27-28	10	12	
North Amer. Cem. pfd.[19]	3-27-28	45	50	$1.75 qu. Aug. 1
North Shore Mat. 1st 6's[15]	3-27-28	99	.....	
Northwestern States P. C.[37]	11-21-27	165	170	
Pac. Coast Cem. 6's, A	2-17-28	95½	.....	
Pac. P. C. new com.[5]	3-22-28	20½	21½	
Pacific P. C.[5]	10-21-27	61¾	.....	25c mo.
Pacific P. C. pfd.	3-23-28	78	80	
Pacific P. C. notes[5]	3-22-28	99	.....	3% s.-a. Oct. 15
Peerless Egyp'n P. C. com.[21]	3-24-28	2	2½	
Peerless Egyp'n P. C. pfd.[21]	3-24-28	85	95	1¾% qu. July 1
Peerless Egyp'n P. C. war.[21]	3-24-28	No market		
Penn-Dixie Cem. 1st 6's[29]	3-27-28	100¼	100½	
Penn-Dixie Cem. pfd.[28]	3-27-28	95	97	1¾% Mar. 15
Penn-Dixie Cem. com.[26]	3-27-28	24¾	.....	50c April 1
Petoskey P. C.[1]	3-28-28	12½	13½	1½% qu.
Pittsfield L. & S.[31]	10- 8-27	.....	100	
Pittsfield L. & S. com.[31]	10- 8-27	.....	25	
Riverside P. C.	3-23-28	185	200	50c mo., $1.50 x. Aug. 1
Rockland-Rockport Lime 1st pfd.[34]	3-23-28	.....	101	3½% s.-a. Feb. 1
Rockland-Rockport Lime 2nd pfd.[34]	3-23-28	.....	60	3% s.-a. Feb. 1
Rockland Rockport Lime com.[34]	3-23-28	.....	25	1½% qu. Nov. 2
Sandusky Cem.	3-28-28	170	210	$2 qu. Apr. 2
Santa Cruz P. C. bonds[5]	3-22-28	105¾	106½	6% annual
Santa Cruz P. C. com.[5]	3-22-28	98	102	$1 qu. Apr. 1
Schumacher Wallboard com.	3-23-28	24	24½	
Schumacher Wallboard pfd.	3-23-28	.....	26¾	
Southwestern P. C. units	5-11-27	205	.....	
Superior P. C., A[20]	3-23-28	47	48	
Superior P. C., B[20]	3-23-28	31½	32½	
Trinity P. C. units[37]	3-26-28	152	156	
Trinity P. C. com.[37]	12-19-27	50	60	
United Fuel & Sup. 1st 6's[27]	7-14-27	98	100	
United Fuel & Sup. notes[27]	7-14-27	98	100	
U. S. Gypsum com.	3-28-28	70	72	40c qu. Mar. 31
U. S. Gypsum pfd.	3-28-28	122	124	1¾% qu. Mar. 31
Universal G. & L. com.[3]	3-27-28	3	4	
Universal G. & L. pfd.[3]	3-27-28	.....	26	1½% Feb. 15
Universal G. & L., V.T.C.[3]	3-27-28	2	4	
Universal G. & L. 1st 6's[3]	3-27-28	67	72	
Upper Hudson Stone 1st 6's, 1951[22]	12-28-27	92	.....	
Vulcanite P. C. 1st 7½'s[32]	12- 5-27	105	109	
Whitehall Cem. Mfg. com.[36]	3-23-28	150	.....	
Whitehall Cem. Mfg. pfd.[36]	3-23-28	95	.....	
Wisconsin L. & C. 1st 6's[15]	3-27-28	100	.....	
Wolverine P. C. com.	3-28-28	6¼	6¾	15c Feb. 15
Yosemite P. C., A com.	1- 4-28	6	.....	

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, Chicago, Ill. [42]E. H. Rollins, Chicago, Ill.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
Asbestos Corp. of Amer., 5 sh. pfd., 5 sh. com.[1]	$1 for the lot	.....
Atlanta Shope Brick and Tile Co[1]	25c	.....
Benedict Stone Corp. (cast-stone), 50 pfd., 390 com.[2]	$400 for the lot	.....
Blue Stone Quarry, 60 sh.[2]	$10¼ for the lot	.....
Eastern Brick Corp., 7% cum. pfd.[1]	40c	.....
Eastern Brick Corp. (sand lime brick) com.[1]	40c	.....
International Portland Cement Co., Ltd., pfd.	30	45
Globe Phosphate Co., $10,000 1st. mtg. bonds, $169.80 per $1000 paid on prin.	$50 for the lot	.....
Iroquois S. & G. Co., Ltd., 2 sh. com., 3 sh. pfd.[1]	$12 for the lot	.....
Knickerbocker Lime Co.[4]	100	.....
Limestone Prod. Corp., 150 sh. pfd., $50 par, and 150 sh. com., no par	$60 for the lot	.....
Missouri Portland Cement Co., 7% serial bonds	104¾	104¾
Olympic Portland Cement Co.[7]	.....	£1⅝
Phosphate Mining Co.[1]	1	.....
River Feldspar & Mill'g Co., 50 com., 50 pfd.[1]	$200 for the lot	.....
Rockport Granite Co., 1st 6's, 1934	90	.....
Simbroco Stone Co.[2]	12	12
Southern Phosphate Co.[6]	1¼	.....
Standard Gypsum Co., 10 sh. pfd., 5 sh. com.[1]	$35 for the lot	.....
Tensas Gravel Co., 180 sh. con.[1]	$1 for the lot	.....
Tidewater Portland Cement Co., 3000 sh. com.	$6525 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Wabash Portland Cement Co.[1]	60	100
Winchester Brick Co., pfd., sand lime brick[5]	10c	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by R. L. Day and Co., Boston. [3]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [7]Neidecker and Co., London, England.

International Cement Corp. Annual Report

INTERNATIONAL CEMENT CORP. reports for the year ended December 31, 1927, a volume of income somewhat in excess of that of 1926, a circumstance that is somewhat unusual for a company engaged in this line of business, where results for 1927 were as a whole somewhat discouraging in comparison with 1926 and prior years. Quarterly earnings had, however, held up well, and final results for the year were no surprise to the market public. For the 12 months ended December 31, 1927, pamphlet report of the company shows a consolidated net income, after taxes, depreciation and depletion, of $4,554,172, on sales of $23,671,138. This is the same as the preliminary income figures published some time ago, and is equivalent to $47.68 a share on the preferred stock, and $6.90 a share on the 562,500 shares of no par value common stock. This compares with a net income of $4,355,199, in 1926, or $44.92 on the preferred, and $6.52 on the common.

The following tabulation compares the sales and income of the International Cement Corp. and its subsidiaries for the last eight years, and affords an accurate comparison of the improvement that has been effected in that time:

Year ended Dec. 31	Net sales	Income available for dividends	Earned a share Preferred	Earned a share *Common	†Addition to earned surplus for year
1927	$23,671,138	$4,554,172	$47.68	$6.90	$1,632,982
1926	21,623,582	4,355,199	44.92	6.52	1,542,675
1925	17,713,900	3,976,385	39.88	7.03	1,716,845
1924	13,683,503	3,047,507	110.19	7.14	1,377,230
1923	11,289,117	2,422,577	164.08	6.37	1,150,609
1922	9,407,725	1,425,047	93.21	4.06	467,398
1921	9,172,311	1,529,901	98.20	4.55	735,235
1920	8,461,896	1,779,559	‡	6.62	1,444,433

*Before preferred stock sinking fund. †After payment of dividends on preferred and common stocks. ‡No preferred stock outstanding in this year, and but a small amount until 1925.

Reason for the increase in sales and profits shown by International Cement in 1927 in the face of generally unsatisfactory conditions in the industry is found in the wide diversity of the company's manufacturing facilities, and in its operation in foreign countries. International Cement acts as a holding company for a group of operating subsidiaries whose plants are located in New York, Texas (two), Kansas, Virginia, Indiana, Alabama, Louisiana, Cuba, Uruguay and the Argentine. Competition along the Atlantic seaboard from foreign cement importations is not felt to any material extent, as International has but two plants in this section of the country, with the balance either inland or in foreign countries. The organization ranks among the largest cement producers in the United States.

Expansion Requirements Affect Working Capital

While dividend payments have not been excessive, and a fair proportion of earnings has been returned to surplus each year, the rapid expansion during the last few years, with but little financing, apart from some common stock sales, has worked against the building up of a strong working capital position. In fact, at the close of 1927, despite the larger earnings of the year, the current financial position is somewhat less favorable than at the 1926 year end. This is attributable entirely to the expenditures made in the course of the year for additions to plant and property, which totaled nearly $3,000,000, apart from funds provided by depreciation and depletion charges against income which were similarly reinvested.

Current assets at December 31, 1927, totaled $6,626,757, including cash of but $488,084, against current liabilities of $2,732,961, with a net working capital of $3,894,066. At December 31, 1926, net quick assets were $5,347,137. Whatever additional financing should prove necessary can easily be met by the sale of additional common stock, as this issue has been strong marketwise. Rumors have been heard that the management contemplated the retirement of the $9,549,800 of 7% cumulative preferred stock, which is callable at 110. Through the issuance of bonds in its stead a considerable saving in charges could undoubtedly be made, and at the same time additional working capital and funds for further expansion provided.

Capitalization consists entirely of the $9,549,800 of preferred stock; and 562,500 shares of no par value common. On the common stock dividends are currently being paid at the rate of $4 a share annually as against a market price around 70.—*Chicago* (Ill.) *Journal of Commerce.*

First Quarter Tentative Report

The *Wall Street News,* in commenting on the probable earnings of the International Cement Corp. for the first quarter of 1928, says:

"Despite the fact that first quarter earnings of cement companies generally are considerably below those of succeeding months of the year, it is understood that International Cement Corp. is meeting an unusual demand for its product for this time of the year. It is expected that net for the three months ending March 31 will amount to approximately $1.50 a share on the 562,500 common shares outstanding compared with earnings of $1.22 a share shown in the corresponding months of 1927 and $1.04 reported in 1926. Such earnings will mark the period as the best initial quarter in the history of the company.

"Continuation of the satisfactory results experienced in the opening months of the year may be looked for in the three succeeding quarters and the same percentage of increase will doubtless at least be maintained if not exceeded. Consumption of cement in the months that will follow are materially larger due to seasonable needs and conditions. Based on the earning power exhibited so far it is reasonable to estimate that earnings for the entire year will amount to upward of $8 a common share, twice present dividend requirements.

"Reports that International Cement will also play a part in the contemplated Pennsylvania Dixie and North American Cement Co. merger are not taken seriously by those who closely follow the activities of International. Some time ago there were preliminary discussions looking toward a merger of International with the Lehigh Portland

CONSOLIDATED BALANCE SHEET AT DECEMBER 31, 1927

ASSETS

	As of December 31 1927	1926	1925	1924
Current assets:				
Cash	$488,084	$1,190,346	$547,121	$829,140
Notes and accounts receivable	1,737,679	2,017,011	1,565,652	1,451,905
Inventories	4,375,000	4,209,562	3,799,295	2,594,112
Marketable securities	25,994	24,237	41,377	681,971
Reserve for exchange	*	46,155	21,967	100,436
Total current assets	$6,626,757	$7,395,001	$5,931,479	$5,456,692
Plant equipment, etc., after depreciation and depletion	33,632,657	30,712,183	28,102,643	14,822,512
Deferred charges	267,535	333,936	363,202	153,150
Total assets	$40,526,949	$38,441,120	$34,397,325	$20,495,354

LIABILITIES

Current liabilities:				
Notes payable	$200,000	.....	.....	$672,625
Accounts payable	1,321,373	$1,033,530	$1,398,855	410,024
Federal tax	569,500	568,320	492,526	157,055
Accrued taxes and expenses	263,183	216,949	180,794	.....
Employes' stock subscriptions	378,635	229,065	56,001	.....
Total current liabilities	$2,732,691	$2,047,864	$2,128,176	$1,239,704
Preferred stock	9,549,800	9,694,000	9,971,700	3,411,800
Common stock	18,482,636	18,593,694	15,605,290	11,115,135
Minority interest in subsidiaries	140,587	165,397	215,797	42,228
Reserves	81,995	99,394	72,964	51,353
Surplus	9,539,240	7,840,371	6,403,398	4,635,134
Total liabilities	$40,526,949	$38,441,120	$34,397,325	$20,495,354
Net working capital	$3,894,066	$5,347,137	$3,803,303	$4,216,988

*Deduction account reserve for foreign exchange; not needed in 1927, as South American exchange above par.

Cement Co., but these were later abandoned and have not been revived.

"When it is considered that trade conditions in 1927 were unsatisfactory due to severe competition with Belgian exporters of the Atlantic seaboard and considerable price cutting among domestic producers, earnings of $4,554,000 equal to $6.90 on common, against $6.52 in 1926, emphasize the position International has attained in the industry. Due to diversification of its mills and territories served, the company does not suffer extensively from the prevailing ills of any particular section of the country. In addition, foreign subsidiaries have proved a profitable investment and are a large factor in the stabilized earning power that International annually displays.

"Plant capacity has increased from 14,700,000 bbl. annually at the close of 1926 to 16,200,000 bbl. at the beginning of the present year. In four years' time production capacity has been increased by some 8,800,000 bbl. and this has been done to great extent through earnings and without outside financial aid. The company continues without funded debt. Addition of some 1,500,000 bbl. capacity in 1927 at the various mills should be reflected in 1928 earnings to an appreciable extent. The three foreign plants in Uruguay, Argentina and Cuba operated at full capacity throughout 1927 and this year will have the benefit of additions to total capacity of 50%, 35% and 25%, respectively."

Certain-Teed Replies in U. S. Gypsum Suit on Beaver Products Acquisition

ALLEGATIONS that the proposed acquisition of the properties and assets of the Beaver Products Co., Inc., and the Beaver Board Cos. by the Certain-Teed Products Corp. will be detrimental to the interests of the United States Gypsum Co. were denied by the Certain-teed Products Corp. in an answer which has been filed in the United States district court here to the bill of complaint of the Gypsum company, which is seeking an order restraining the acquisition.

Following lengthy litigation over the alleged infringement of United States Gypsum Co.'s patents by the Beaver Products Co. and the Beaver Board Cos., the three companies reached an agreement whereby the Beaver Products Co. paid the Gypsum company $250,000 in cash and was granted a license under the Gypsum patents for the manufacture of gypsum wallboard, paying 5% royalty on the selling price to August 6, 1929, when the so-called Utzman patents expire, and 1½% thereafter to February 10, 1937, when certain other patents expire.

The proposed acquisition of the assets of the Beaver companies by Certain-teed, the Gypsum company alleged, will leave the Beaver companies without assets to carry out the provisions of its licensing contract, but to this the Certain-teed replied that under the terms of its purchase contract provision had been made for the satisfaction and discharge of all of the obligations of both companies, and that it had offered to assume the Beaver Products Co.'s license agreement until 1937 as to the property purchased. This, the answer alleges, was not acceptable to the complainant unless Certain-teed would also agree to pay like royalties on all wallboard manufactured by it at its present plant in Texas or elsewhere. The answer states that in order to avoid litigation the Certain-teed offered to accept a license from the United States Gypsum Co. on all plants of the Certain-teed to August 6, 1929, but this offer, it is alleged, was not accepted. It also was denied that the Beaver Products Co. intended to repudiate its contract.

Allegations also were made by the Certain-teed that the United States Gypsum Co. has unlawfully sought to dominate and monopolize the wallboard industry in violation of anti-trust laws.—*Chicago* (Ill.) *Journal of Commerce.*

Purchase of Manitoba Gypsum by Canada Gypsum Approved

AT a special general meeting of shareholders of Canada Gypsum and Alabastine, Ltd., in Paris, Ont., the purchase of the business and properties of Manitoba Gypsum Co., Ltd., of Winnipeg, and of its subsidiary, British Columbia Gypsum Co., Ltd., was approved. The necessary new financing to take care of this purchase was also agreed upon.

From information given by the president of the company at the meeting it appears that in addition to an issue of securities in connection with this extension of business, the shareholders will be given the opportunity to subscribe for additional shares of common stock. For this purpose, subscription rights are to be allotted, giving shareholders the right to purchase two additional shares for each five shares held as at the close of business March 13, 1928. Share capital of the company upon the issue of additional shares as indicated, will consist of approximately 76,000 shares of no par value. There are no preferred shares outstanding. The stock is at present paying at the rate of $3 per share per annum.—*Wall St. News.*

(In Rock Products for March 3, 1928, it was stated that there was a report that the Canada Cement Co. had purchased the Manitoba Gypsum Co. of Winnipeg. In light of later developments it is obvious that this first report was in error, and that the Canada Gypsum and Alabastine, Ltd., instead of the Canada Cement Co. acquired the Manitoba company.)

New Bonds Offered

In connection with the recent purchase, offering is made of a new issue of $2,500,000 Canada Gypsum and Alabastine, Ltd., 5½% first mortgage 20 year sinking fund gold bonds series A, by Royal Securities Corp. The bonds are priced at 97½ and accrued interest to yield about 5.70%. The proceeds of these bonds will be applied toward retiring the presently outstanding 6½% debentures and toward the purchase price of the newly acquired properties. Earnings for the year ended December 31, 1927, were $645,146, equivalent to 4.69 times the annual interest requirement of $137,500 on bonds now to be outstanding.—*Chicago* (Ill.) *Journal of Commerce.*

Recent Dividends Announced

Alpha P. C., com. (quar.).....75c, Apr. 14
Asbestos Corp., Ltd., pref. (quar.).....
.....1¾%, Apr. 16
Arundel Corp. (quar.).....50c, Apr. 2
Atlas P. C. Co., pref. (quar.)....66⅔c, Apr. 2
Canada Cement, Ltd., pref. (quar).....
.....1⅝%, Mar. 31
Certain-teed Prod. Co., com. (quar.).....
.....$1, Apr. 1
Certain-teed Prod. Co., 1st and 2nd pref. (quar.).....$1.75, Apr. 1
Cleveland Stone (quar.).....50c, June 1
Consolidated Sand, Ltd., pref. (quar.).....
.....1¾%, Apr. 2
Ebsary Gypsum (annual).....10%, Mar. 15
Ideal Cement, com. (quar.).....$1, Apr. 2
Ideal Cement, pref. (quar.).....$1.75, Apr. 2
International Cement, com. (quar.).....
.....$1, Mar. 30
International Cement, pref. (quar.).....
.....1¾%, Mar. 30
Kelley Isl. Lime and Trans. (quar.).....
.....62½, Apr. 2
Kentucky Rock Asphalt, com. (quar.).....
.....25c, Apr. 1
National Gypsum, pref. (quar.)..1¾%, Apr. 1
Penn.-Dixie Cement, com. (quar.).....
.....50c, Apr. 1
Penn.-Dixie Cement, pref. (quar.).....
.....1¾%, Mar. 15
Sandusky Cement, com. (quar.)....$2, Apr. 2
Santa Cruz P. C., com. (quar.).....$1, Apr. 1
U. S. Gypsum, com. (quar.).....40c, Mar. 31
U. S. Gypsum, pref. (quar.)....1¾%, Mar. 31
Chas. Warner Co., com. (quar.)..50c, Apr. 10

Michigan Limestone and Chemical Preferred Redeemed

MICHIGAN LIMESTONE AND CHEMICAL CO. 7% preferred stock will be redeemed April 2 at 105 and accured dividends.

Danish Cement Company Plans Capital Increase

RELIABLE REPORTS indicate that the A/S Aalborg Portland Cement Fabrik, one of the largest cement manufacturers in Denmark, is to increase its capital from 2,400,000 to 4,800,000 crowns. The action is presumably taken as a result of the establishment of a new German cement plant, the Nye Nordiske Portland Zement Fabrik, A.S., at Aalborg, and that the new money available will be used to install more modern mill equipment.—H. Sorenson in *U. S. Commerce Reports.*

Discussion of Bureau of Public Roads' Report on Comparative Tests of Crushed-Stone and Gravel Concrete

Abstract of an Article in the March Issue of the "National Sand and Gravel Bulletin"

By Stanton Walker

Director, Engineering and Research Division of the National Sand and Gravel Association, Washington, D. C.

THE comparative tests of crushed-stone and gravel concrete carried out through the co-operation of the U. S. Bureau of Public Roads and the New Jersey State Highway Commission furnish much information which merits careful study. The report prepared by Mr. Jackson is an accurate and concise statement of the results of the tests and his discussion has been written with great care to avoid the possibility of the data being misinterpreted or of being applied generally as a criterion of the concrete-making properties of crushed stone and gravel.

It is our belief, however, that the investigation is incomplete in some respects, that certain of the conclusions drawn by the author are not fully justified by the test data and that a further discussion of certain features of the investigation will be helpful.

A general criticism which may be offered of the entire investigation is that consideration is given to only one aggregate of each type. Mr. Jackson recognizes this deficiency in the investigation and points out that the results should be considered as "applicable only to the same kinds of material produced in a similar manner." He also points out that other tests which the bureau now has under way, and which we understand will be available by the latter part of this summer, indicate that the characteristics of the particular aggregate used may be fully as important as the type of material to which it belongs.

It would have been helpful if the present report had included the results of such tests. Their inclusion would present information concerning the relative merits of crushed-stone and of gravel which could be applied more generally and would eliminate the possibility of too broad conclusions being drawn from these data. The fact that the crushed stone used in the tests was a very hard, tough and dense rock is an added reason for making desirable the consideration of tests of other materials. The gravel used was a good grade of material with physical characteristics well within the usual specification limits, but possessing no exceptional features.

Not Conclusive on Relative Flexural Strengths

The statement that these tests should not be construed as a criterion of the relative concrete making properties of crushed stone and gravel in general, so far as transverse strength is concerned, is well supported by results of tests from other investigators. Tests carried out by Abrams at the Structural Materials Research Laboratory and reported in his Bulletin 11 on "Flexural Strength of Plain Concrete" show that the gravel tested (from the Chicago Gravel Co.) gave results at least as high as were obtained from a good quality crushed limestone, crushed granite and crushed blast furnace slag.

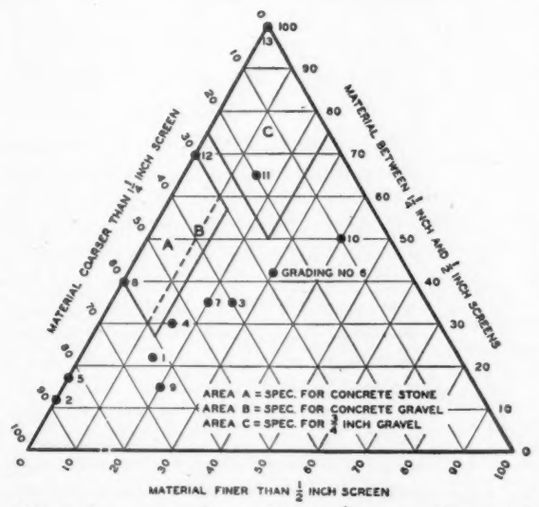

MATERIAL COARSER THAN ¼ INCH SCREEN
MATERIAL BETWEEN ¼ INCH AND ½ INCH SCREENS
MATERIAL FINER THAN ½ INCH SCREEN
GRADING NO 6
AREA A = SPEC. FOR CONCRETE STONE
AREA B = SPEC. FOR CONCRETE GRAVEL
AREA C = SPEC. FOR ¾ INCH GRAVEL

Chart for comparison of aggregate gradings and specification requirements

Not Standard Specification Aggregate Gradings

A second general criticism which may be made of the investigation is that, while it was designed as a study of conditions applicable to New Jersey, only two of the 13 grading of crushed stone and four of the gravel fall within the limits of the current specifications: *In other words, 77% of the tests were made with aggregates which would not be permitted in paving construction in New Jersey because of their grading.*

Fig. 1 provides a convenient method of showing clearly the relation of each of the gradings tested to existing specifications of the state of New Jersey. The aggregate gradings have been arbitrarily divided into the following three sies:

1. Material above 1¼ in.
2. Material passing 1¼ in| and retained on ½ in.
3. Material passing ½ in.

These divisions were selected since they seem to represent the more important size limitations in the specifications. The percentage passing the 1¼ in. screen for the aggregates used in the tests were determined by straight-line interpolation. Area "A" represents the approximate limits of the New Jersey Specification for concrete stone, "B" for concrete gravel and "C" for ¾ in. gravel. While the diagram does not show all of the detail• of the specifications, it confirms the study of the sieve analyses.

It would seem highly desirable in a study of existing conditions to include at least some gradings typical of those commonly used in practice. None of the gradings tested, with the possible exception of one in the case of gravel, meets that condition.

Grading Fully as Important as Type of Aggregate

All of the comparisons of the two aggregates in the report are based on the averages of the 13 gradings and no importance is attached to the effect of grading, in spite of the fact that the differences in strength due to this factor were two or three times greater than those attributed to the type of aggregate. Consequently the comparisons are based entirely on the same gradings, while, under the existing conditions of which the investigation was intended as a study, the gravel and trap-rock as furnished to the job in accordance with specifications would not

ordinarily be similarly graded.

While 13 gradings and only two aggregates were tested, no recommendations are made for taking advantage of better graded materials for the reason that a definite relationship was not found; in fact, it is stated that the grading of the coarse aggregate had very little direct effect upon the strength of the concrete. In accordance with the conclusion that the stone produced about 12% higher transverse strength, it is recommended in the report that, for equivalent slab strengths, the gravel concrete should be made with a thickness of about 6% greater than the stone concrete.

On the basis of these tests and by a similar process of reasoning, variations in pavement thickness of as much as 16% might logically be required, due to the differences in grading. It seems hardly logical to eliminate differences of two and three times 12% from all consideration and at the same time to make definite recommendations with respect to another variable based on the much smaller difference.

The fact that the strengths do not seem to follow any well-known measure of grading of aggregate should not be sufficient to eliminate this factor from all consideration, especially when certain other tests have indicated definitely that grading is an important factor. On the other hand, if this failure to obtain expected results with reference to grading makes it seem desirable to give no consideration to this aspect of the tests, it would appear inconsistent to give credence to the tests in other respects.

A study of the data in the report would indicate that differences in strength obtained with the different gradings were brought about by a variable which affected both the gravel and the stone alike, since the curves for the two aggregates closely follow each other. If the comparison is made on the basis of the averages of the 28-day and 6-month tests, this view is supported. If these variations are due to differences in grading, these tests, as well as others, would indicate that a consideration of the grading is of even greater importance than that of the type of aggregate.

Cement Requirements Also a Criterion

Certain of the gravel gradings gave higher strengths than certain of the stone gradings and it will be appreciated that if the gravel gradings which gave the higher strengths were compared with the stone gradings which gave the lower strengths, it would be necessary to modify the conclusions with respect to the comparative flexual strengths of the two materials. We are not, of course, suggesting that this is the proper basis of comparison, but we do suggest that differences in grading should be given consideration, and that the data should answer the question of what is the comparison of economy and concrete making properties of typical gradings of gravel and of crushed stone.

A more complete investigation than this would have provided information from which it could be determined what changes in cement content, proportions and gradings of aggregate, etc., would be necessary to place the two aggregates studied on an equal basis. The method of compensation by increasing the thickness of the slab is only one of several which might be applied. Proper changes in grading, proportioning or cement content would serve the same purpose, and the relative economy of these methods should be investigated.

It is interesting to note, however, that the cost of materials required to provide the additional slab thickness of 6.1%, recommended in the report, is approximately the same as the cost of the additional cement required by the crushed stone. The economic advantages of gravel are discussed in detail by Mr. Jackson under the heading of "Yield of Concrete Discussed." When the advantages of gravel due to yield are eliminated, the outstanding advantages due to workability, ease of handling, etc., still exist and are recognized in the report.

Bethany, Missouri, Quarry to Be Reopened

THE RAND STONE QUARRY, closed for the last year because of failure of the Bethany Crushed Stone Co., Bethany, Mo., will be reopened soon under new ownership and will be placed on full-time operation.

The quarry and all equipment has been sold to the Concrete Materials Corp., of Waterloo, Iowa, a company said to be operating three other quarries in Iowa. H. D. Bellamy is president.

The plant had been owned for several months by L. M. Crossan, Bethany lumberman, who bought it when sold under court order to satisfy judgments against the stone company. The Iowa firm paid $5,450 for the property, it is said.

Arrangements for reopening the quarry have been made. Operations are to be on a 24-hour basis, using three shifts working eight hours each. About 30 men will be used on each shift.

It is understood the company already has contracts that will handle all the rock that can be taken from this quarry. Shipments may run about 15 cars of crushed stone a day.

If the supply of rock is as good and as plentiful as it appears to be, the head of the Iowa firm said, his company will spend near $200,000 in payrolls in handling contracts already in sight. Much of the local product is expected to go into Iowa for highway construction, which is just starting on an organized plan there. The quarry also would supply material for Missouri road jobs in this part of the state.

The Chamber of Commerce gave the new owners permission to use a railroad spur near the fair grounds which runs alongside a loading tipple built by the former operators of the quarry. The Chamber of Commerce shared in the cost of building the spur several years ago and it reverted back to the organization after the stone company quit operations.

Since the Bethany Crushed Stone Co. shut down the quarry has been flooded with water from Big creek, which broke through a retaining dike on the west side during a flood season. After Mr. Crossan bought the property he had the water pumped out. A coating of mud on the floor of the quarry sump is yet to be removed.

After being under water for many months, it is not known just what condition the machinery is in, although the crushers and other important pieces of equipment are not believed to be damaged much.—*Bethany* (Mo.) *Clipper.*

Iowa Lime Rock Corporation Rushes Work on New Plant

THE QUARRY and crushing plant of the newly incorporated $50,000 Iowa Lime Rock Corp., of Oksaloosa, Iowa, will be located near the town of Tracy, just over the line in Marion county. The company now holds options on 210 acres of land with a ledge of lime rock 38 ft. in depth.

The plant will have a capacity of 325 tons of crushed rock daily and will be equipped with all types of modern grading, storage and loading devices.

Main offices of the company are to be located in Oskaloosa, and while F. B. Bacon of this city has been designated as local distributor of the products, the company is negotiating for state-wide distribution.

Rock for concrete construction and lime rock for agricultural purposes will be produced. Samples of the rock have been tested at the Ames Agricultural Experiment Station and are reported exceptionally high in qualities for both paving and farm uses. John Shultz, of Minneapolis, Minn., is to superintend installation of the new plant.

The work of setting up the plant will be pushed along as rapidly as possible and H. W. Harding, president of the company, says that he expects to be operating within the next 60 days.—*Oskaloosa* (Iowa) *Herald.*

Fourth Edition of English Booklet on Sands

A COPY of the fourth edition of the booklet entitled "Sands, Clays, and Economic Minerals for all Industrial Purposes" by Algernon Lewin Cartin, has been recently received. The demand for the earlier editions of the pamphlet, containing data on practically every well-known type of sand, necessitated the printing of this edition which is as complete as its predecessors.

The book was prepared under the direction of Mr. Curtis at his Westmoor Laboratory, Chatteris, England.

Cement Industry Makes Astonishing Progress in Accident Prevention During 1927

By A. J. R. Curtis
Assistant to the General Manager, Portland Cement Association

SURPRISING indeed are the reports of safety activities in the American and Canadian cement mills during 1927, revealing the largest annual reduction of accidents, both in actual number and in percentage, since these records were started ten years ago by the Portland Cement Association.

Most of the available superlatives were employed last year in reporting the reduction of cement mill accidents during 1926, and the record justified all that was said about it. A year ago the showing was considered so good that some of the superintendents saw little possibility of reducing accidents much farther and many had reason to feel that they had their hands full to maintain the fine record then reached.

The general expectancy for 1927 was therefore quite modest, in the light of which the results are of unusual interest. They set new records for almost everything measurable in safety work in cement and comparable industrial operations. Measure these accomplishments by any yardstick you will, whether in terms of lost time or fatal accident frequency or of severity as judged by the loss of time to injured workmen, and the results will indicate that the industry has found out how to reduce its accidents and is pursuing the task with irresistible force.

Some 1927 Records

Here are some of the outstanding facts revealed by the preliminary statistics for 1927:

Lost time accidents in the 136 plants reporting in 1927 totaled 1369, a reduction of 37% from the record of 2174 such accidents in the 124 plants reporting in 1926. The 1927 figures represent a decrease of 46% from the record of 2548 lost time accidents in 118 plants in 1925. In 1927 there was less than one accident to every 120,000 bbl. of cement produced.

There were 31 fatal accidents in the 136 mills reporting in 1927, against 47 in the 124 mills in 1926 and 61 in the 118 mills in 1925. The reduction of fatal accidents per plant exceeds 50% for the two year period.

The average number of lost time accidents per month in 1927 was 114, equal to about 0.84 accidents per mill, compared with 181 or 1.47 per mill in 1926, and 217 or 1.84 per mill in 1925. The highest monthly rate during this period was 2.19 accidents per plant in October, 1925, and the lowest 0.47 per plant during the June No-Accident Campaign of 1927.

Ten cement plants were awarded the Portland Cement Association trophy for operating during the year without a lost time accident. Two other mills had no lost time accidents but did not operate a total of six months during the year, the minimum requirement for a trophy award. One additional mill operated during the entire year without any lost time accidents but withdrew from the trophy contest when forced by a ruling of a state commission to pay compensation in a case where the company holds no lost time accident actually occurred. Altogether 13 plants went through the year without an accident serious enough to cause a single day's loss of time.

Fourteen mills operated during the year with but one lost time accident each, nine mills had only two such accidents each, five mills had only three each, and a total of 59 mills had five accidents or less.

The best 25% of the mills (34 plants) reporting in 1927 had 30 lost time accidents, averaging less than one accident each for the entire year. No plant in this group suffered more than two lost time accidents. The lost time accidents reported by the best 25% amounted to about 2% of the misshaps of this class suffered by the 136 plants included in the study. They involved losses amounting to 1958 days' time, five permanent disabilities and three deaths. The best 25% of the plants reporting their accidents in 1926 (31 mills) had 172 lost time accidents, amounting to 8% of the total reported. These accidents caused the loss of 3095 days' time, 10 permanent disabilities and nine deaths.

The better 50% (68 mills) reporting in 1927 had 190 lost time accidents, amounting to 14% of the total reported, or an average of 2.8 accidents per mill for the year. The poorer 50% of the mills suffered 1179 accidents, 86% of the total or about 17 accidents per mill. The mill making the poorest showing in the study suffered 86 lost time accidents and the next two poorest records show 55 and 52 accidents respectively. In 1926 the plant at the foot of the list reported 115 lost time accidents.

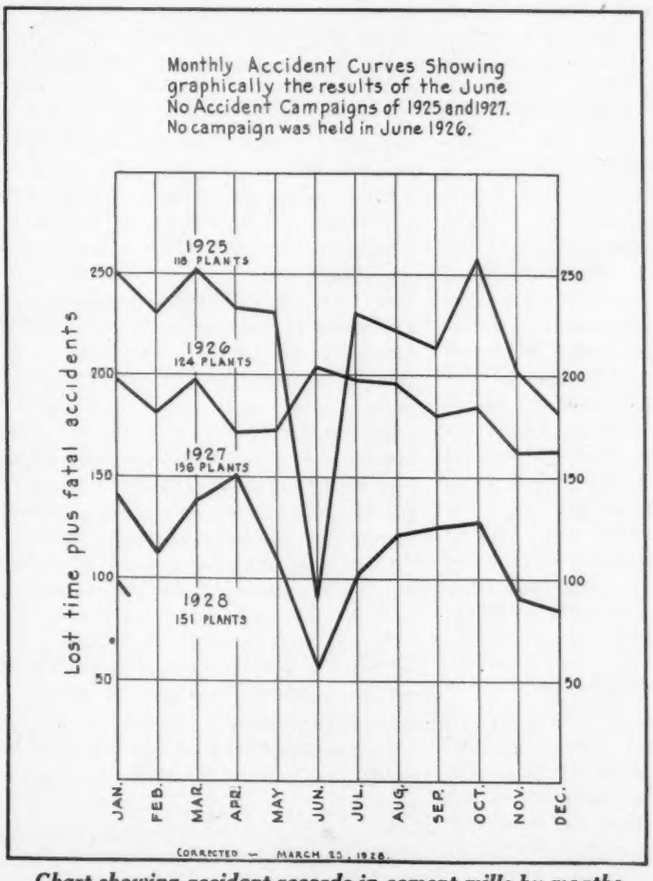


Chart showing accident records in cement mills by months, 1925-1927

Number of mills operating each month of 1927 without lost time, permanent disability or fatal accidents:

January	71
February	84
March	74
April	69
May	80
June	122
July	89

August	78
September	76
October	80
November	82
December	93

Forty-two plants operated without accident during the first quarter, 26 completed the first half of the year similarly, and 18 plants succeeded in operating with clear records during three-quarters of the year. In addition to the plants which completed the entire year without accident, many established new records for continuous accident-free periods. Three plants in addition to the trophy winners ran over eleven months without accidents; six had continuous accident-free periods over ten months in length; 13 had similar intervals over nine months each; and 42 had a six months continuous accident-free period each. Only three mills in the study had no month without accident.

The eight plants of the New York-Hudson region reported 56 lost time accidents in 1927; 22 plants of the Lehigh region reported 224 accidents; and 80 mills located in Maryland, Virginia, western Pennsylvania, West Virginia and Ohio, reported 86 accidents. Ten Michigan mills finished with a total of 127 mishaps, while the 21 mills located in Indiana, Kentucky, Illinois, Iowa, Missouri, Wisconsin and Minnesota suffered 277 accidents involving loss of time. Ten mills located in the states south of Virginia and Kentucky and east of the Mississippi river had 113 similar accidents, and six mills of Texas had 28 accidents involving loss of time. Ten mills of the Kansas, Nebraska and Oklahoma region had 59 accidents and 22 mills located in the Rocky Mountain and Pacific Coast states had 337 accidents. Ten Canadian plants finished the year with 62 accidents. Other foreign plants participating in the study are not reported, since they operate under labor and general conditions too dissimilar to permit proper comparison.

First No Accident Month

September, 1927, was the first month on record during which the industry operated without a single fatal accident and according to government figures more cement was produced during September, 1927, than during any preceding month with the exception of August of that year.

The secret of the reduction of 463 lost time accidents, in a single year, with 30% fewer fatal accidents, is explained by the splendidly organized personnel of the mills, encouraged by the general interest of executives determined to outlaw accidents by preventing the employment of those who were not willing to put caution foremost.

Perhaps no American industry has secured so complete a committal of its employes to prevent injury to themselves and others as was contained in the workmen's enrollment pledges circulated throughout the industry in June, 1927. It is estimated that practically all operating employes, between 42,000 and 43,000, signed these cards. Over 33,000 cards were returned to the Portland Cement Association bearing signatures or marks of the workmen. Fifty-odd accidents suffered during that month amounted to less than 1/7 of 1% of the number of cards signed. The workmen of the industry were thus found to be 99.86% careful and alert, fully as great a proportion as we believe could be found in any comparable industry.

Lehigh Valley Mineral Industries to Hold Conference at Easton

ANNOUNCEMENT has been received of the coming conference of the Lehigh Valley Mineral Industries to be held at Easton, Penn., on April 25, 26 and 27, 1928. This conference is open to all architects, builders, engineers or others interested in any phase of the construction industry, and should furnish the opportunity for the delegates to obtain a greater knowledge and appreciation of the industries and possibilities of the Lehigh Valley. The conference will have the opportunity to visit slate quarries and mills, cement and steel plants, as well as visiting both Lehigh and Lafayette universities. In the counties of Lehigh and Northumberland and adjacent territory in the Lehigh Valley it is stated there is produced approximately one-half of the slate and cement consumed throughout the United States and, of course, all are aware of the size and extent of the Bethlehem Steel Co.'s plant.

The conference will be divided into three distinct sections—the first day being given over entirely to cement, the second to slate and the third to steel. The Alpha Portland Cement Co. has taken over the details of the first day largely, including the arranging of the program for the general evening meeting. The second day's session will be under the auspices of the A. I. M. E., and will include a number of papers of interest on slate production and uses, as well as a visit to slate plants.

The headquarters of the conference will be at the Easton hotel in Easton.

Program

WEDNESDAY, APRIL 25—CEMENT DAY

9:00 Registration of delegates at conference headquarters.
10:00 Meeting, Committee D-16 on Slate, A. S. T. M., Lecture Room, Lafayette College.
12:15 Luncheon, Hotel Easton, Gold Room.
1:30 Inspection trip to Alpha Portland Cement Co.'s plants at Martin's Creek as guests of that company. Transportation from Hotel Easton and return will be furnished.
6:30 Complimentary dinner at Hotel Easton to registered delegates as guests of the Alpha Portland Cement Co.
8:00 Hotel Easton. Meeting, open to all, on Cement. Papers, "History and Manufacture of Portland Cement," by L. Anderson; "Modern Method of Design of Concrete," by J. G. Bragg, and others; motion picture, "Cementing the Centuries."

THURSDAY, APRIL 26—SLATE DAY

9:00 Meeting, on Slate. Presentation of papers on physical tests, architectural uses, standardization, wire saws in quarrying and abrasive materials.
11:00 Ceremony of breaking ground for the new John Markle Mining Bldg. will be held on Lafayette College campus followed by an inspection of the buildings and grounds. Address by Scott Turner, Director of U. S. Bureau of Mines.
12:30 Luncheon for registered delegates at Pen Argyl or Ross Common, Penn., as guests of the Structural Slate Co., Natural Slate Blackboard Co., Vendor Slate Co., Chapman Slate Co. and Bangor Slate Association.
1:30 Inspection of various slate quarries and mills under the auspices of the above companies. Transportation for luncheon and inspection trip will be furnished.
6:30 Conference dinner.

FRIDAY, APRIL 27—STEEL DAY

10:00 Inspection of Lehigh University at Bethlehem, Penn.
1:30 Inspection of Bethlehem Steel Co. plant.

Standard Samples of Cement Available

THE United States Bureau of Standards is now prepared to furnish standard samples of cement for testing, having added that commodity to its newest list of standard samples available. The cement samples are for use in determining the fineness of the product, and are to be had in two grades, normal and extra fine. The number of the normal sample is 46m while the other is 47d. Either may be had by applying to the Bureau of Standards, the cost being $1.00 for a regular sample of 160 grams. The bureau will also furnish its Circular No. 25, free of charge, describing the history and use of the various kinds of samples, including th etwo for cement mentioned above.

George Oscar Curtis

GEORGE OSCAR CURTIS, chief purchasing agent for the International Cement Corp., died on March 5. He had been connected with the cement industry almost continuously since he entered the field in 1900, having been engaged outside of the field for only two years since that time. He was at first connected with the Iola Portland Cement Co. and the Knickerbocker Portland Cement Co., and later joined the staff of the International Cement Corp., where he remained until his death. During most of his connections with the cement companies he acted in the capacity of purchasing agent.

Mr. Curtis was born on September 13, 1875, at Adrian, Mich. He was a member of the Elks Club, the Shrine and the New York Athletic Club. He is survvived by three sons.

Decision Against Gas Tax Curtails Illinois Highway Work

ON February 24 the Supreme Court of the state of Illinois handed down a decision invalidating the gasoline tax which had been effective in the state since last August. The decision was based on the facts that the act was discriminatory in that it exempted certain classes from the tax and also that kerosene as a motor fuel was not included in the act. Other points in the decision covered faulty and discriminatory distribution of the tax money, and technicalities in the wording of the bill. The decision will have far-reaching effects on the highway program in Illinois this year, since practically every county in the state had laid out its building program to be financed by returns from the tax. The programs can hardly be carried out under any other means of financing at this time, and this means that producers of road building materials will find a much lower demand for highway materials in the state than in any year since Illinois began its extensive road program. Practically the only county which will not have to alter its highway plans is Cook county, in which the city of Chicago is located. This county, under the discriminatory act, would have received such a negligible amount of the gas tax funds that its financing was necessarily done by other means than the tax money, and hence the decision will have little effect there. There is at present approximately $8,000,000 collected by the state since last August, and for which no plan of expenditure has yet been put forward.—*Chicago* (Ill.) *Tribune.*

Georgia Limestone Deposit To Be Developed

THE American Limerock Corp., Savannah, Ga., was recently incorporated. The incorporators included Frederick A. VonEberstein, Barton A. Horswell, P. A. Horswell, M. O. Dunning and F. M. Oliver, all of Chatham county.

The initial capital of $50,000 has been paid in. The purpose of the corporation is to develop and market the limerock deposits of a section of Crisp county, about eight miles west of Cordele. The deposit of limerock, which it is proposed to work, is situated on lands owned by the Horswells, and the company has closed the transaction by which it gets control of it.

The Seaboard Air Line railway has entered into an agreement with the promoters to construct a spur track something like a mile long.

The limerock in this deposit, which covers a territory one mile long and a quarter of a mile wide, is to be used for a base for highways in Georgia and other states. The state of Georgia has made an analysis of it and has found it answers specification requirements. The deposit will also be developed for agricultural limestone.

There is said to be no immediate fear of a lack of a market for the new product. It is understood that contracts have been signed or will be signed by which large amounts of the limerock will be placed on the market as soon as preparations are made for mining it.

The present owners of the property, in making a survey of their holdings, sent samples to different authorities. They all reported the material as having splendid value for the purpose suggested.

The state highway commission is said to have had the rock tested and to have given it approval as a road base if it can be marketed quickly and at not too great an expense. It is proposed to use the material on roads for a depth of 8 in. rolled to a depth of 6 in. as is done with Ocala rock and similar materials. It is estimated that there are not less than 20,000,000 tons of the material available in Crisp county.

The principal office of the American Limerock Corp. is to be in Savannah. It is expected that organization will be perfected just as soon as the charter is granted and Savannah men will be officers of the new company.

Little time is to be lost in beginning operations. The Seaboard Airline railway has had maps drawn and surveys made looking to the immediate extension of the spur track into the heart of this rock formation. This means that shipments are to begin very soon.

A number of Savannah men are to be financially interested in the new organization.—*Savannah* (Ga.) *Express.*

Bruce Mines Quarry Operation to Be Revived

EOTA P. SMITH, formerly president of the Great Lakes Stone and Lime Co., (Rockport) Alpena, Mich., which plant he sold in 1922 to the Kelley Island Lime and Transport Co., Cleveland, Ohio, now announces that he has sold the plant, equipment and quarry of the Bruce Mines Trap Rock Co., Ltd., Bruce Mines, Ont., to a syndicate consisting of Greir Investment Co., Ltd., Williams Partridge and Rapley, Ltd., Montreal, Que.

The two concerns mentioned are underwriting an issue of stock approximating $1,000,000 and organizing a company to be called the Dominion Trap Rock Co., Ltd., with its head office at Montreal, Que.

The purchasers, or rather the new owners, have already bought a modern bulk freighter of 7000 tons capacity, which is being converted into a self-unloader of the type so successfully operated in the Great Lakes rock trade.

The plant at Bruce Mines, Ont., is undergoing extensive alterations under the direction of Perry E. Haworth, who has been appointed general manager by the new owners.

This makes available a trap rock of an excellent quality; in fact, the rock from this quarry was used exclusively by the Great Lakes Dredge and Dock Co. and Oscar Daniels & Co. in the construction of the last two government locks at Sault Ste. Marie, Mich., and on other projects of equal importance.

The project has an interesting history. It will be remembered by old-timers as Martin's International Trap Rock Co.

New Los Angeles Rock and Gravel Plant Officially Opens

MORE than forty officials, representing ten cities, Los Angeles county, the state, and several civic and improvement organizations, attended the formal opening and inspection of the new million-dollar rock products plant of California Materials, Inc., at Irwindale, near Baldwin Park, recently.

John D. Gregg, general manager, showed his guests the many modern improvements installed for the careful washing and accurate grading of sand, gravel, and other varieties of aggregate used in construction of roads, and general building.

After inspecting the plant the party was escorted to a large tent near the plant office where Mr. Gregg invited his guests to join in an old-fashioned grilled steak dinner prepared over an open pit.

Ira Pontius, president of the Baldwin Park Chamber of Commerce and First National Bank, was appointed toastmaster and introduced speakers and guests. Short talks were made by Adela Rogers St. Johns, prominent writer; John R. Keene, president, Western Asphalt Association; Louis Mathews of Covina; F. S. Anabel, general superintendent, Pacific Electric Railway; Rex Kennedy of Whittier; Thomas W. Moore, manager, Public Improvement Association; Walter E. Saxe, consulting engineer; Paul Todd of the Portland Cement Association, and Myron Haig, Secretary, San Gabriel Valley Development Association.

Among those present were: C. M. Weber, J. E. Metzger and F. D. Barr of the state department of public works; O. S. Cooley, assistant road commissioner of Los Angeles county; Charles H. Diggs, Los Angeles county planning commissioner; James Fiske, mayor of San Gabriel; Chris Campbell, mayor of Alhambra; Charles Coughran, F. T. Heintz, J. S. Bacon and W. D. Marshall of Baldwin Park; B. G. Martin, secretary, Whittier Chamber of Commerce; F. L. Williams, president, Azusa Chamber of Commerce, and A. R. Haas of San Gabriel.—*Los Angeles* (Calif.) *Examiner.*

Foreign Abstracts and Patent Review

Reducing Man Power in Cement Plants. An up-to-date cement plant comprises three or four rotary kilns. These form the nucleus of the plant about which the control and handling of raw materials, pulverizing of the clinker, etc., rotate. Three kilns with an average output give the conservative figure of 4250 bbl. per day assumed here. This daily output requires about 1150 tons of dry raw materials, or about 1450 tons as received, for which two steam shovels are maintained, the larger one digging limestone. Each shovel requires three men, but with strictly modern equipment, two men per shovel may be assumed. The work of the shovel is completed by three to four men helping with the loading. Steam shovels require two men for carrying water and coal, whereas the electric types require but one man. The latter will not be necessary in the future, when shovels driven by Diesel engines and benzol will be the rule. Altogether the quarrying operations require 11 men, this figure to be reduced to 9 in the future.

Dependent on conditions at the quarry, additional men are required for clearing the quarry, drilling blast holes, etc. The number of these men cannot be estimated in a general way. In his book, "Portland Cement," Meade provides 22 men for quarrying operations, of whom 4 carry out the blasting. The latter figure appears very low, but is assumed as an ideal here. The operation of two quarries under the most favorable conditions will require 17 men in the near future.

Assuming that the materials are dry, of uniform composition, and that very large storage bins are provided, one craneman and two men serving the slurry mills would be sufficient. This means that a powerful crane discharges the entire output of the quarry to the bunkers, from which the materials are drawn to the slurry mill by one man on the day and night shifts. One more man should be provided for the inspection of conveying machinery, bearings, etc., during each shift.

All three kilns require but one man per shift. Present day equipment requires another man to take care of the lubrication. He may at times replace the kiln operator. An experienced operator can leave the kiln for a half hour at a time, unless variations of the quantity and composition of the mix or of the quality of the fuel make constant supervision necessary. It is possible that in the near future a kiln will operate somewhat like an automobile engine, with the supply of fuel, the admission of air, and the lubrication taking place automatically. The production of pulverized coal is largely automatic in the United States, where the greatest progress has been achieved in this connection. With reliable mills and sufficiently large silos, in which coal and pulverized coal for several hours' operation can be stored, the supervision of the coal pulverizer may be entrusted to the kiln operator, whose task will be greatly simplified in the future. In electric power plants we find bucket conveyors automatically feeding the coal hoppers of several boilers placed side by side. Though costly, this American method of automatic feeding of fuel does away with a craneman. Supervision is then entrusted to one of the two men available per shift, as mentioned above.

In recent years much has been said about the utilization of waste heat. Though the heat of the clinker has never been wasted in Germany to quite the extent common in America, further progress would bring distinct advantages. In this connection the author (Hans Engel) suggests a method borrowed from the steel industry, where the pig iron is discharged into traveling ladles of 800 tons capacity, from which it is drawn into the Bessemer converters in accordance with the needs of the latter. Similar traveling containers could be introduced in the cement industry to receive the clinker. It remains to be proved that they can be made economical in spite of the comparatively low value of cement clinker. It is quite certain that the clinker heat would be utilized effectively in such closed, mechanically operated containers. The mills would receive clinker cooled to surrounding temperature, a condition which is certain to be appreciated by any practical man.

The largest mills on the market today have a somewhat greater capacity than the largest kilns, and long interruptions due to shutdowns are less frequent with mills. Therefore, three mills should be provided for four kilns or two mills for three kilns. However, it is not recommended to provide less than three mills in a cement plant to insure continuous service.

A crane operator who adds the required quantity of gypsum in accordance with the recording apparatus showing the kiln output at intervals frequent enough to insure uniform distribution of the gypsum during pulverizing, can hardly be eliminated. Conveying the finished product from the mills to the storage silos is but a matter of funds. When automatic, it requires expensive machinery and repairs, but hardly any man power. Ideal operation calls for but one man per shift at the mill and one man per shift at the gypsum mill and feeding device. The quarrying of gypsum can be reduced to one shift storing up enough gypsum for the entire day's operation. The crushed gypsum is drawn from the silos automatically. The importance of providing cement silos of large capacity can hardly be overemphasized.

The number of men in the packing room is determined by dividing the 21,000 bags per day (2100 bags per hour) by the hourly capacity of the Bates packing machines. This would require 5 men at the machines and 10 at the cars, but this total of 15 men serving the 5 sackers appears high. Most German plants, however are not equipped with Bates sackers and, consequently, employ an even larger number of men.

To the men employed in the cement plant proper must be added the number of men in the power plant, shops, coal and gypsum storage, warehouse and laboratory. One locomotive with one man per shift can do all of the required switching of cars. The man power in the power plant remains the same whether we deal with a waste heat or pulverized coal installation, the ideal plant requiring 3 stokers and 3 mechanics. The size of the turbo-generator and boiler is determined by the selection and number of kilns. One mechanic and one stoker per shift could handle the work involved by the daily output considered here. The warehouse requires one man and one official. Much saving of man power can be accomplished in planning the warehouses for materials, as well as the storage of paper and jute bags, along tracks. The chief of laboratory needs two assistants.

A plant of 4000 to 5000 tons capacity uses daily over 200 tons of coal and almost 20 tons of gypsum, i.e., a total of 15 to 20 carloads. Two men could handle the dumping of these materials. A crane operated by one man is indispensable for unloading the coal. The various automatic devices undergo considerable wear and increase the work of the repair shops. It should be kept in mind that for every 10 men removed from the plant, one new man must be employed in the shop, the net saving of man power thus is nine men.

Many suggestions have been advanced with regard to making the manufacture

of paper bags and the packing largely automatic. Undoubtedly in the future cement will be shipped in bulk in tightly closed cars, as is the custom in shipping gasoline or ore, and the distribution will be made closer to the place of use.

The author believes that in a few years the ideal plant described here will become the average plant in Germany and that cement production will grow tremendously due to the introduction of labor-saving principles in the manufacture of this very important product.—*Tonindustrie-Zeitung* (1927), **90**, 1637-38.

Binary and Tenary Diagrams of the Lime - Silica - Alumina System. Melting points curves of $SiO_2 \cdot Al_2O_3$, $CaO \cdot SiO_2$ and $CaO \cdot Al_2O_3$ binaries are given. Preliminary study of ternary system $CaO \cdot SiO_2 \cdot Al_2O_3$ shows melting point of 86 members in the system, including diagram. The weight changes which occur in heating hydrated $CaO \cdot Al_2O_3$, $3CaO \cdot 5Al_2O_3$, $5CaO \cdot 3Al_2O_3$, and $3CaO \cdot Al_2O_3$ have been determined. Experiments on the setting and hardening of the aluminates are described (Table I).

Linear changes on heating the aluminates from room temperature to about 1000 deg. C. are reported. Descriptions the hydration of the aluminates with micro- are given on the changes which take place in photographs. *Sendai (Japan) Tech. School, Research Reports*, **5**, 1-28, and *Ceramic Abstracts* (1928), **3**, 140-141.

TABLE I.

	$CaO \cdot Al_2O_3$	$3CaO \cdot 5Al_2O_3$	$5CaO \cdot 3Al_2O_3$	$3CaO \cdot Al_2O_3$
Calcium aluminuates	3:5	1:1	5:3	3:1
Temp. rise in hydration (°C.)	2.0	19.0	43.3	52.2
Time of the maximum rise (min.)	4	3	4.5	4
Final set (hr.-min.)	2-38	0-47	3-30	2-15
Sounduess	sound	sound	cracked	disintegrated
Compressive strength				
At 1 hr. (kg./sq. cm.)	12.00	70.50	4.20	2.00
At 2 hr. (kg./sq. cm.)	20.50	80.25	4.98	22.80
At 24 hr. (kg./sq. cm.)	110.00	93.00	.....	83.60

Melting Point Curves of Limestone-Clay Mixtures. Melting point curves of mixtures of limestones and clays used for the manufacture of portland cement are given, the melting point being determined by the bending of cones made of the mixtures. (1) The average of the 21 experiments comprising 15 limestones and 17 clays are shown (Tables I and II).

(2) The proportions of limestone and clay in the mixtures corresponding to portland cement range from 6.5 : 3.5 to 7 : 3, most of them being nearer to the latter than to the former. The 7 : 3 mixtures melt at temperatures ranging from 1437-1660 deg., while the range for 6.5 : 3.5 mixtures is 1285-1580 deg. (3) An addition of iron ore to a clay causes a marked reduction in the refractories of its mixture with a limestone. Tables III and IV show such an effect on the mixtures of limestone I, containing 0.80 SiO_2, 0.38 Al_2O_3, Fe_2O_3, and FeO, 54.40 CaO, 0.97 MgO, 0.17 NaKO, 43.59 CO_2, and 1.11 insolubility residue, and clay B, containing 70.92 SiO_2, 10.70 Al_2O_3, 2.96 Fe_2O_3, and FeO, 3.92 MgO, 0.96 CaO, 1.86Na_2O, 2.02 K_2O, 6.05 loss on ignition, and 0.08 MnO.

Thermal Analysis of Mixed Cements. Weight losses which occur in heating hardened pastes composed of portland cement and 3-10% calcium chloride or 5-10% antifreezing agent, consisting of CaO 34.94, MgO 3.27, NaCl 3.27, SO_3 13.93, ignition loss 18.90, insoluble matter 0.38, and P_2O_5 0.05, have been determined with a thermobalance. *Sendai (Japan) Tech. School, Research Reports*, **6**, 7-8, and *Ceramic Abstracts* (1928) **3**, 143.

Artificial Stone. A hot aqueous solution of a metallic chloride capable of forming an oxychloride with magnesia, *e.g.*, magnesium, ferric, or calcium chlorides, containing also 5-10% of an alkali silicate, is mixed with finely-divided magnesia or calcined magnesite and a finely-divided filler, *e.g.*, metallic oxides, siliceous or aluminous clay, calcareous earth, etc. If the filler is a calcareous earth or alkiline clay, an alum or other metallic sulphate is added to the liquid metallic chloride instead of the silicate, and the product so obtained with the filler is set, powdered and mixed with about double the amount of magnesite to form a cement. *British Patent No.* 281,757.

Artificial Stone. Organic or asbestos fiber is treated with a special solution comprising sodium silicate solution, turpentine, a precipitant such as milk of lime, and a binder (portland cement) *British Pat. No.* 280,104.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Composition for Removing Stains from Plaster Walls. A composition for removing set stains in a wall, comprising glue serving as a binding body, soap serving as a detergent, and lime serving as an eradicator, said ingredients being compounded substantially in the following specifying proportions by weight: Soap, 1 part, glue ¾ part and lime 11¾ parts.—*U. S. Patent No.* 1,651,996.

Wallboard Edge. The edge portions of the board are reinforced by a moisture absorptive reinforcing strip imbedded in the core of the green board.—*John Schumacher, U. S. Patent No.* 1,653,474.

Treatment of Rock Asphalt for Making Road Material. The method consists in reducing rock asphalt to the consistency of sand, adding thereto a small quantity of gilsonite to increase the asphaltic content of the mixture to about 9%, and of lime substantially 1% of the weight of the rock, agitating and stirring said mixture and simultaneously subjecting the same to a temperature sufficient to intimately mix and blend the particles of gilsonite with the softer Kentucky asphalt and below a temperature which would drive off any great amount of the volatile bituminous content of the Kentucky rock asphalt.—*S. S. Sadtler, U. S. Patent No.* 1,650,047.

Aluminate Cement. Raw materials of suitable composition, as, for example, equal parts of limestone and bauxite or other lime-yielding materials of average composition which will produce in a typical case a cement containing approximately 6% of silica, 41% of alumina, 11% of iron oxide and 1% undetermined material, are made up as a charge. This charge is put into the usual type of rotary cement kiln and fired by a fuel, the fuel being sufficient to maintain a temperature high enough to cause complete melting of the charge. As the charge passes through the kiln it is subjected to the action of sufficient air to prevent reduction of the iron compounds to a metallic or ferrous state. The molten charge or slag after discharge from the kiln is chilled and the final product ground to usual fineness. *H. S. Spackman, U. S. Patent No.* 1,643,137.

TABLE I.—CHEMICAL ANALYSIS OF LIMESTONES AND CLAYS

	Silica	Alumina Ferric and ferrous oxide			
		0.08-0.38			
15 limestones	0.05- 0.80				
17 clays	44.02-75.74	10.70-30.72	2.20-11.20		
Lime	Magnesia	Soda	Potash	Carbon dioxide	Insol. ratio
54.40-56.08	0.17- 0.97	0.00- 0.20		43.39-44.08	0.06-1.35
0.00- 6.76	0.65- 3.92	0.00-2.16	0.00-5.62	.....	.....
Manganous oxide	Loss on ignition				
.....	.....				
0.00- 0.15	0.70-11.08				

TABLE II.—MEAN MELTING POINT

Limestone (%)	100	95	90	85	80	75	70	65	60	55	50
Clay (%)	0	5	10	15	20	25	30	35	40	45	50
Melting point (°C.)	1914	1892	1846	1771	1710	1632	1541	1424	1357	1309	1280
Limestone (%)	45	40	35	30	25	20	15	10	5	0	
Clay (%)	55	60	65	70	75	80	85	90	95	100	
Melting point (°C.)	1268	1259	1252	1253	1259	1273	1299	1332	1378	1426	

TABLE III.—MELTING POINTS OF MIXTURES OF LIMESTONE I AND CLAY B

Limestone (%)	100	95	90	85	80	75	70	65	60	55	50
Clay (%)	0	5	10	15	20	25	30	35	40	45	50
Melting point (°C.)	1920	1920	1880	1825	1740	1650	1530	1415	1410	1407	1415
Limestone (%)	45	40	35	30	25	20	15	10	5	0	
Clay (%)	55	60	65	70	75	80	85	90	95	100	
Melting point (°C.)	1408	1397	1388	1381	1357	1356	1377	1397	1435	1444	

TABLE IV.—EFFECT OF IRON ORE ADMIXED TO CLAY B ON THE MELTING POINT OF ITS MIXTURES WITH LIMESTONE I

Limestone (%)	85	80	75	70	65	60
Clay (%)	15	20	25	30	35	40
Melting point (°C.) Clay B with 1 % iron oxide	1680	1640	1580	1451	1331	1325
Melting point (°C.) Clay B with 1.5% iron oxide	1610	1560	1550	1428	1256	1337
Melting point (°C.) Clay B with 2 % iron oxide	1600	1550	1500	1411	1376	1327

—*Sendai (Japan) Tech. School, Research Reports*, **5**, 283-304, and *Ceramic Abstracts* (1928), **3**, 139.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Feb. 25	Limestone Flux Week ended Mar. 3	Sand, Stone and Gravel Week ended Feb. 25	Sand, Stone and Gravel Week ended Mar. 3
Eastern	1,832	1,977	1,334	2,044
Allegheny	2,773	2,817	1,956	2,661
Pocahontas	235	239	450	664
Southern	457	524	7,809	8,347
Northwestern	523	770	1,334	1,868
Central Western	446	454	5,211	5,594
Southwestern	368	340	3,512	4,689
Total	6,634	7,121	21,606	25,867

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

District	Limestone Flux 1927 Period to Date Mar. 5	Limestone Flux 1928 Period to Date Mar. 3	Sand, Gravel and Stone 1927 Period to Date Mar. 5	Sand, Gravel and Stone 1928 Period to Date Mar. 3
Eastern	19,380	15,925	14,047	15,073
Allegheny	28,070	24,219	21,486	18,333
Pocahontas	1,354	1,928	3,258	3,992
Southern	4,251	4,513	86,949	74,676
Northwestern	7,279	5,156	18,887	13,117
Central Western	3,625	3,481	43,321	46,002
Southwestern	2,288	3,484	34,621	36,699
Total	66,247	58,706	222,569	207,892

COMPARATIVE TOTAL LOADINGS 1927 AND 1928

Limestone flux	***66,247***	***58,706***
Sand, stone, gravel	***222,569***	***207,892***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning March 24:

SOUTHERN FREIGHT ASSOCIATION DOCKET

38884. **Stone, crushed,** from Florida points to Dawson, Ga. It is proposed to establish the following reduced rates on **stone, crushed, carloads** (See Note 3), to Dawson, Ga.: From Haile, Fla., 176c; Istachatta, Fla., 180c; Thompson's Spur, Harvard and Groover Spur, Fla., 176c; Rutland, Fla., 176c; Reddick and Kendrick, Fla., 180c; Branford, Fla., 176c; McAllister, Fla., 180c per net ton. Suggested rates are made on basis of scale used in establishing rates from Florida origins to Georgia points.

38904. **Crushed stone** from Whitestone, Ga., to San Antonio, Tex. It is proposed to establish through rate of 680c per net ton on crushed stone, carloads, from Whitestone, Ga., to San Antonio, Tex., based on Memphis-Shreveport combination, the suggested rate to be subject to the minimum weights applicable in connection with the factors to and beyond Memphis-Shreveport.

38980. **Sand and gravel** from Johnsonville, Tenn., to Monglewood, Tenn. Present rate, 189c per net ton (Gibbs, Tenn., combination). Proposed rate on sand and gravel, in straight or mixed carloads (See Note 3), from Johnsonville to Monglewood, Tenn., 125c per net ton, based on the joint line mileage scale prescribed in Docket 17517.

39020. **Sand and gravel,** from Memphis, Tenn., to Berclair, Tenn. Present rate, 57c per net ton. Proposed intrastate rate on sand and gravel, in straight or mixed carloads, subject to present carload minimum weight, from Memphis to Berclair, Tenn., 50c per net ton, based on I. C. C. Docket 17517 scale for the distance.

39037. **Gravel** from Camden, Tenn., to Lawrence and Oakfield, Tenn. Present rate, 118c per net ton (Martin, Tenn., combination). Proposed rate on gravel, carloads (See Note 3), from Camden, Tenn., to Lawrence and Oakfield, Tenn., 105c per net ton. Based on the joint line scale prescribed in I. C. C. Docket 17517 for 80 miles and over 60 miles.

Amendment 1 to 38904. **Crushed stone** from Whitestone, Ga., and Tate, Ga., to San Antonio, Tex. Submittal No. 38904, included in Docket No. 410, for March 26 hearing, proposes establishment of rate of 680c per net ton on crushed stone, carloads, from Whitestone, Ga., to San Antonio, Tex., based on Memphis, Tenn., combination. This proposition is now amended to suggest the same rate from Tate, Ga.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

14124. **Limestone, crushed or ground,** carloads, minimum weight 60,000 lb., from North Adams, Mass., to Millers Falls, Mass., 5c. Reason—To meet motor truck competition.

14134. **Sand, blasting, core and fire,** carloads (See Note 2), from Medway, Mass., to Mills, Mass., 5c; to Norwich and Willimantic, Conn., 8c; to Portland, Hartford, New London, Conn., 9c; to New Britain, Meriden, Waterbury, Bristol, Southington, Conn., 9½c; to Middletown, Union City, Ansonia, Branford, Derby, Naugatuck, South Norwalk, Torrington, Bridgeport, 10c; to Stamford, Cos Cob, Conn., 10½c; to Port Chester, N. Y., 11c. Reason—To meet competitive conditions.

14157. **Gravel and common sand,** carloads (See Note 3), from Milton, N. H., to Barre, Vt., $1.70 per net ton, via Wells River, Vt., and the M. & W. R. R. R. Reason—To establish a commodity rate comparable with those now effective for similar distances.

14178. **Sand, blasting, core, fire and sea,** carloads (See Note 2), from Provincetown, Mass., to Milton, Mass., 9½c. Reason—To permit of movement at rates based the same as those of the interested parties, competitors.

14179. **Sand, building, common or run of bank,** carloads (See Note 2), from Buckland, Conn., to all points on the N. Y. N. H. & H. R. R., same scale of commodity rates as provided for this sand in carloads (locally) from other points of origin on the N. Y. N. H. & H. R. R. Co. to N. Y. N. H. & H. R. R. points, page 394 of N. Y. N. H. & H. I. C. C. No. F2795, 3½c per 100 lb. to 9c per 100 lb. Reason—To meet competitive conditions.

4180. **Sand, building, common on run of bank,** carloads (See Note 2), from Plainville, Conn., to all points on the N. Y. N. H. & H. R. R., same scale of commodity rates as provided for this sand in carloads (locally) from other points of origin on the N. Y. N. H. & H. R. R. to N. Y. N. H. & H. R. R. points, page 394 of N. Y. N. H. & H. I. C. C. F2795, 3½c to 9c per 100 lb. Reason—To meet competitive conditions.

4196. **Core sand and molding sand,** carloads (See Note 3), from Lynn, Mass., to Everet, Mass., 90c per net ton. (To expire six months from effective date.) Reason—To meet barge competition.

14200. **Limestone, agricultural,** carloads (See Note 3), from Ashley Falls, Great Barrington, Lee, Pittsfield, Sheffield, West Stockbrdge, Canaan, Danbury, East Canaan, New Milford, Redding, Mass., to Carteret, N. J., 16c via Communipaw, N. J., C. R. R. of N. J. Reason—To provide same rate as is now in effect to other Newark rate points.

14206. **Gravel and common sand,** carloads (See Note 3), from Milton, N. H., to Middlesex, Vt., $1.75 per net ton, via White River Jct. and C. V. Ry. Reason—To establish a commodity rate comparable with those now effective for similar distances.

14210. **Screened gravel,** carloads (See Note 3), from Albany, N. Y., to Wassaic, N. Y., $1.30 per net ton, via B. & A. R. R., Chatham, N. Y., N. Y. C. R. R. Reason—To establish rate comparable with existing rates.

14211. **Sand, common** (not molding, fire, filter or blasting), **run of the bank or screened, gravel, screened, and stone, crushed** (trap rock), carloads (See Note 3), from North Wilbraham and Westfield, Mass., to Tivoli, N. Y., $1.60; to Barrytown, N. Y., $1.65 per net ton; via Selkirk Jct. or Rensselaer, N. Y., and N. Y. C. R. R. Reason—To establish commodity rate on sand and gravel from North Wilbraham same as on trap rock from Westfield.

CENTRAL FREIGHT ASSOCIATION DOCKET

17828. To establish on **crushed stone,** carloads, Bedford, Ind., and points in the Bedford districts to points on the E. & O. V. Ry. via the E. I. & T. H., E. & O. V. at Evansville, rate of $1.32 per net ton. Present rate, combination basis.

17845. To establish on **stone dust,** in box cars, carloads, McVittys, Ohio, to Muncie, Ind., rate of $1.68 per net ton. Present rate, $2 per net ton.

17846. To establish on **ground or pulverized limestone** (unburnt), carloads, minimum weight 60,000 lb., from Painesville, Ohio, to Bessemer, Belle Vernon, Pittsburgh, Monongahela, McKeesport, Washington, West Newton, Penn., and points usually accorded same rates or arbitraries higher as specified in B. & O. Eastbound Rate Basis and Billing Instructions I. C. C. No. 4, rate of 200c per net ton. Present rate, 17c.

17852. To establish on **sand and gravel,** carloads (See Note 3), Sturm and Dillard Siding, Ohio, to Ohio, rates as shown below. Present and proposed rates as shown (proposed rates in cents per ton of 2000 lb.; present rates, sixth class, in cents per 100 lb.):

From Sturm and Dillard Siding, Ohio

To D. T I & I. R.R.	Pres.	Prop.	To D. T I & I. R.R.	Pres.	Prop.
Wash. C. H.	105	13	Switch	90	15
Boyds	105	13	Jackson	90	15
Good Hope	100	13	Bloom Jct.	100	16½
Ghormleys	100	13	Herbert	100	17
Greenfield	100	13	Hayward	105	17
Thrifton	100	13	Andre	105	17
Fruitdale	100	13½	Cornwell	105	17
Humboldt	100	13½	Crawford	105	17
Bainbridge	95	13½	Superior	105	17
Dills	95	13½	Wagner	105	17
Storms	95	13½	Goldcamp	105	17
Spargoursville	90	14	Halley Farm Switch	115	17
Harris	90	14	Lisman	115	17
Summit	90	14	Pedro	115	17
Denver	85	14	Royersville	115	17
Peck	85	14	Vesuvius	115	17
Sosco	85	14	La Grange	115	17
Waverly	85	14	Wellston Br.:		
Glen Jean	85	14	Chapmans	95	15
Gregg	....	....	Coalton	95	15
Givens	85	14½	Glen Roy	95	15
Robbins	85	14½	Wellston	95	15
Beaver	85	14½	Ratchford	100	15
Glade	85	15	Lincoln	100	15
Cove	90	15	Cornelia	100	15
Rottinghouse Switch	90	15	Dean Br.:		
Hammertown			Lawrence	115	17
			Bartles	115	17

17866. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) and **gravel,** carloads, Lake Ciecott, Ind., to Francesville, Ind., rate of 80c per net ton. Present rate, $1.01 per net ton.

17871. To establish on **sand** (except blast, core,

engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and gravel, carloads, Anderson, Ind., to Indiana points. rates as shown below. Present and proposed rates (per ton of 2000 lb.):

To	*Pres.	Prop.	To	*Pres.	Prop.
Westfield	$0.70	$0.81	Gadsden	$0.70	$0.92
Eagletown	.70	.92	Heath	.70	.92
Joliet ville	.70	.92	Lebanon	.86	1.04
Rosston	.70	.92			

*C. I. Ry. Tariff No. 874; I. R. C. No. 682; I. C. C. No. 580.

17872. To establish on sand, core, carloads, Kankakee, West Kankakee, Greenwich and Van's Siding, Ill., to Indiana and Michigan, rates as shown below. Present and proposed rates (in cents per net ton):

To	Prop.	Pres.
Evansville, Ind.	239	*265
Indianapolis, Ind.	139	*227
Muskegon, Mich.	176	6th cl.
South Bend, Ind.	101	6th cl.
Terre Haute, Ind.	164	6th cl.

Present commodity rates published in C. F. A. Tariff Bureau 100U, I. C. C. 1963.

*From Kankakee only.

17874. To establish on sand and gravel, carloads, Lorain, Ohio, to points in Ohio on P. R. R. and W. & L. E. Ry., rates as shown below. Route—Via N. C. & St. L. R. R., Cleveland, Ohio, and P. R. R. (except as noted). Present and proposed rates:

Destinations—	Present	Prop.
Salem	6th class	110
Leetonia	6th class	110
Columbiana	6th class	125
East Palestine	6th class	125
Irondale	6th class	125
East Liverpool	6th class	140
*Steubenville	6th class	150

*Via N. Y. C. & St. L. R. R., Bellevue, Ohio, and W. & L. E. Ry.

17875. To establish rate of 90c per net ton on crushed stone, carloads, Greenfield, Ohio, to Cincinnati, Ohio. Route, D. T. & I., Washington Court, Ohio, Penna. Co. Present rate, 100c per net ton.

17877. To establish on agricultural limestone, in bulk, in open top cars, carloads, Piqua, rates as shown below. Present and proposed, from Piqua, Ohio:

To	Proposed, per net ton	Present, 6th class
Athens, Ohio	$1.20	18
Marietta, Ohio	1.30	20½
Pomeroy, Ohio	1.20	20

17879. To establish on sand and gravel, carloads, Vincennes, Ind., to St. Francisville, Ill., rate of 73c per net ton, and to Ledford, Ill., 98c per net ton. Present rates, 88c per net ton to St. Francisville, Ill., and $1.38 per net ton to Ledford, Ill.

17884. To establish on sand (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), and gravel, carloads, Lake Ciecott, Ind., to Bass Lake Junction, Ind., via P. R. R. and Erie R. R., rate of 85c per net ton. Distance, 47 miles. Present rate, commodity rate of $1.04 per net ton.

17885. To establish on sand (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), and gravel, carloads, Northberne, Ohio, to Greendale, Ohio, via P. R. R. and H. V. Ry., rate of 80c per net ton. Present rate, $2.40 per net ton.

17886. To establish on sand and gravel, carloads, Gosport, Ind., to Coal City and Hubbell, Ind., rate of 90c per net ton. Present rate, sixth class.

17908. To establish on crushed stone, carloads, West Columbus, Ohio, and quarries between West Columbus and Highway, Ohio, on N. Y. C. R. R., to Amesville and Lathrop, Ohio, rate of 100c per net ton. Present rate, commodity rate of 90c per net ton.

17909. To establish on sand and gravel, carloads, Merom and Riverton, Ind., and Palestine, Ill., to South Linton, Ind., rate of $1.01 per net ton. Present rates, sixth class.

17910. To establish on limestone, ground or pulverized, carloads, minimum weight 40,000 lb., Piqua, Ohio, to Michigan, rates as shown in Exhibit A attached. Present rates as shown to Akron, Ohio, and Michigan points.

(Rates per ton of 2000 lb.)

To	Pres.	Prop.	To	Pres.	Prop.
Akron, O.	$4.50	$2.70	Cass City	4.80	2.90
Albion	3.28	A2.39	Charlotte	3.28	2.60
Alma	3.28	2.70	Cedar Spgs.	4.50	2.80
Almont	4.50	2.70	Clare	4.90	2.90
Baldwin	5.20	3.10	Clifford	4.50	2.70
Bay City	3.28	2.70	Durand	3.28	2.60
Bay Port	4.80	2.90	Edmore	4.50	2.70
Benton Harb.	4.30	2.60	Ferrysburg	3.28	2.70
Caro	4.80	2.70	Flint	3.28	2.60
Carsonville	4.60	2.70	Gd. Haven	3.28	2.70
Caseville	5.00	3.00	Gd. Rapids	3.28	2.70
Greenville	4.60	2.80	Pentwater	5.20	3.10
Holland	3.28	2.70	Pt. Austin	5.00	3.00
Howard City	4.80	2.90	Pt. Hope	5.00	3.00
Ionia	3.28	2.70	Pt. Huron	3.28	2.60
Ithaca	$3.28	$2.70	Reed City	5.00	3.00
Kalamazoo	3.02	B2.39	Saginaw	3.28	2.90
Lakeland	3.28	C2.39	St. Clair	3.28	2.60
Lansing	3.28	2.60	St. Joseph	4.30	2.60
Ludington	5.20	3.10	So. Haven	4.40	2.60
Marine City	3.28	2.60	Sparta	4.50	2.80
Marysville	3.28	2.60	Sturgis	3.02	D2.39
Midland	3.28	2.70	White Cloud	5.00	3.00
Muskegon	3.28	2.80	Wixom	3.28	E2.39
Owendale	4.80	2.90	Woodbury	3.28	2.70
Owosso	3.28	2.60	Zilwaukee	3.28	2.70

A—Intermediate to Battle Creek, Mich.

B—To place Kalamazoo, Mich., on the same basis at Battle Creek, Mich. Class rates from Piqua, Ohio, to these destinations being on the same basis.

C—Intermediate to Pontiac and Jackson, Mich.

D—Intermediate to Kalamazoo, Mich., on the P. R. R., and Battle Creek, Mich., on M. C. R. R.

E—Intermediate to Pontiac, Mich.

WESTERN TRUNK LINE DOCKET

6444. Stone, crushed, including rubble stone (See Note 3). In no case shall the minimum weight be less than 40,000 lb. From Mellen, Wis., to Chicago, Ill., Milwaukee, Manitowoc, Wis., St. Louis and Kansas City, Mo., also to destinations in C. F. A. and E. T. L. territories. Present, various rates; proposed, as follows:

Chicago, Ill.	11	St. Louis, Mo.	17
Milwaukee, Wis.	11	Kansas City, Mo.	19½
Manitowoc, Wis.	11		

6444. Stone, crushed, including rubble stone (See Note 3). In no case shall the minimum weight be less than 40,000 lb., from Mellen, Wis., to Chicago, Ill., Milwaukee, Manitowoc, Wis., St. Louis and Kansas City, Mo., also to destinations in C. F. A. and E. T. L. territories. Present, various rates; proposed, as follows:

Chicago, Ill.	11	St. Louis, Mo.	17
Milwaukee, Wis.	11	Kan. City, Mo.	19½
Manitowoc, Wis.	11		

To establish rates to C. F. A. and E. T. L. territories based on the same differential over Stevens Point, Waupaca or Montello as exists in the rates to Chicago.

6453. Stone, crushed, carloads (See Note 3), but in no case less than 40,000 lb., from Bethany, Mo., to stations on the C. B. & Q. R. R. in Iowa within a distance of 150 miles. Present, class basis. Proposed—Rates on basis of the Nebraska single line scale, as per C. B. & Q. G. F. O. 11677Z and similar issues, which is also applicable from stations in Nebraska to stations in Iowa and Missouri, for single line hauls, as per C. B. & Q. G. F. O. 16060D and similar issues, and which provides the following rates for the distances involved:

50 miles	3½c	100 miles	6c
60 miles	4c	115 miles	6½c
70 miles	4½c	130 miles	7c
80 miles	5c	145 miles	7c
90 miles	5½c	160 miles	7½c

TRUNK LINE ASSOCIATION DOCKET

18070. (A) Sand, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads; (B) Sand, blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Mapleton District, Penn., to Norfolk, Va., (A) $3 and (B) $3.24 per ton of 2000 lb. Reason—To establish the same rates as are now in force to Richmond, Va., as per P. R. R. G. O. I. C. C. No. 14553.

18071. (A) Sand, other than blast, engine, foundry, glass, molding, quartz, silex and silica sand, and gravel, carloads; (B) Sand, blast, engine, foundry, glass, molding, quartz, silex and silica sand, carloads (See Note 2), from Whiting, N. J., to Phillipsburg, N. J., (A) $1.40, (B) $1.40; and to Easton and Bethlehem, Penn., (A) $1.60 and (B) $1.75 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from Pinewald as per C. N. J. I. C. C. G2909.

18076. (B) Agricultural, land, chemical, gas and glass lime, carloads, minimum weight 30,000 lb., and (C) Ground limestone, carloads, minimum weight 50,000 lb., from Ashcom, Penn., to Ferndale and Johnstown, Penn., (B) 11c, and (C) 10c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Martinsburg, W. Va., to Ferndale and Johnstown, Penn., as per B. & O. R. R. I. C. C. No. 21047.

18088. Sand, viz., glass, engine, molding, silica, ground flint, quartz or silex, carloads (See Note 2), from Mapleton District, Penn., to Hazlehurst, Penn., $2.60 per ton of 2000 lb. Reason—Proposed rate is comparable with rates now in force to Mt. Jewett, Johnsonburg, St. Marys and Kane, Penn., as per P. R. R. G. O.-I. C. C. 14553.

18119. Refuse, limestone, ground (See Note 2), from Lime Crest, N. J., to Philadelphia, Penn., $2.20 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates on ground limestone from Bellefonte, Penn., to Philadelphia, Penn., as per P. R. R. G. O.-I. C. C. 14567.

18126. Limestone, fluxing, carloads, from Ogdensburg, N. J., to Matawan, N. J., $1.74 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Atlas, N. J., to Matawan, N. J.

18137. Limestone, agricultural, ground, precipitated or pulverized, and limestone dust, carloads, minimum weight 50,000 lb., from Jamesville and Rock Cut, N. Y., to Erwins, Canisteo, Andover, Wellsville, Cuba, Olean, Vandalia, Salamanca, N. Y., and various, rates ranging from 10½c to 12c per 100 lb. Also proposal to cancel present rates on the above commodities from Jamesville and Rock Cut, N. Y., to Elmira and Elmira Heights, N. Y., of 9c, and to Horseheads, N. Y., to Painted Post, N. Y., inclusive, of 10c per 100 lb., account of D. L. & W. R. R. local rates to these points being lower and can make satisfactory deliveries on its own rails. Reason—Proposed rates are comparable with rates from Jamesville, N. Y., to Stockport, Wallace, Avon and Hornell, N. Y.

18139. Broken stone, carloads (See Note 2), from Holmesburg, Penn., to Tottenville, N. Y., 13c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Holmesburg, Penn., to New York, N. Y., and compare favorably with rates on rough stone from Holmesburg, Penn., to New Brighton, N. Y., and from Stockton, N. J., to South Beach, N. Y., as per P. R. R. G. O. I. C. C. 13940 and 14357.

18142. Sand, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, and gravel, carloads (See Note 2), from Farnham, N. Y., to Buffalo, N. Y., 65c per ton of 2000 lb. Reason—Proposed rate is comparable with rates now in force from Attica, Springville and Machias, N. Y., to Buffalo, N. Y., as per P. R. R. G. O. I. C. C. 14726, B. R. & P. I. C. C. 8044 and Erie R. R. I. C. C. 17571.

18145. Lime, agricultural and fluxing, having no commercial value for chemical or building purposes; and limestone, unburnt, ground or pulverized, carloads, minimum weight 30,000 lb., except on limestone 50,000 lb., from B. & O. R. R. kilns in the Martinsburg-Frederick-Strasburg groups as shown in B. & O. R. R. I. C. C. No. 21047, to Juno, W. Va., 17c per 100 lb. Reason—Proposed rates compare favorably with rate to Iaeger, English, Susanna, W. Va.

18152. Broken stone, carloads (See Note 2), from St. Peters, Penn., to Atlantic City, N. J., $1.85 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from St. Peters, Penn., to Philadelphia, Penn., and from Birdsboro, Penn., to Philadelphia, Penn., and Atlantic City, N. J., as per Reading Co. I. C. C. No. 195.

18162. To establish rate of $2.65 per ton on unburned ground limestone, carloads, minimum weight 50,000 lb., from New Hamburg and Montrose, N. Y., to stations on the Central New England Rl., except Bethel, Conn., to Hartford, Conn., inclusive, to which points rates will be $3.20 per net ton. Reason—Proposed rates compare favorably with rates now in force on ground limestone from Dover Plains, N. Y., as per N. Y. C. I. C. C. N. Y. C. 15611.

18170. (A) Sand, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads; (B) sand, blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 3), from Lewes, Del., to Gratersford, Penn., (A) $2.40 and (B) $2.61 per ton of 2000 lb. Reason—Proposed rates are comparable with those now in force from Lewes, Del., to Collegeville, Bethlehem, Downingtown and Reading, Penn., as per P. R. R. G. O. I. C. C. No. 14194.

18171. Sand, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads; gravel, pebbles or crushed stone, carloads (See Note 3), from Morrisville and Tullytown, Penn., to Farmingdale, N. J., $1.40 per ton of 2000 lb. Reason—To establish the same rates for C. R. R. of N. J. delivery as now in force for P. R. R. delivery as per P. R. R. G. O. I. C. C. Nos. 14628, 14467 and 13940.

18177. Sand and gravel, carloads, from South Lakewood, N. J., to Asbury Park, N. J., 60c per net ton (to apply as maximum at intermediate points). Reason—Proposed rate is fairly comparable with other similar movements.

18199. Sand, other than blast, engine, glass, molding, foundry, silica, silex or quartz, and gravel, carloads (See Note 2), from Springville, N. Y., to Barnes, Penn., $1.60 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Springville, N. Y., to Tidioute, Sheffield, Summerville and Brookville, Penn., as per B. R. & P. Ry. I. C. C. 8077.

18203. Sand, blast, engine, foundry, glass, molding, silex or silica, carloads (See Note 2), from Daguscahonda, Penn., to Marienville, Penn., $1.35 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Daguscahonda, Penn., to Eriton, Penn., from Falls Creek, Penn., to Kittanning and Smethport, Penn., etc., as per P. R. R. G. O. I. C. C. 14726 and B. R. & P. Ry. I. C. C. 8077.

18205. **Fluxing limestone,** carloads (See Note 2), from Annville, Myerstown and Palmyra, Penn., to Williamstown, N. J., $2.30 per ton of 2240 lb. Reason—Proposed rates compare favorably with rates on like commodity from and to points in the same general territory as per Reading Co. I. C. C. 298, P. R. R. G. O. I. C. C. 14302 and L. & H. R. I. C. C. A1782.

19210. **Limestone, ground, precipitated or pulverized, and limestone dust,** carloads, minimum weight 50,000 lb., from Atlas, Hamburg and Lime Crest, N. J., to stations on the N. Y. C. R. R. (in cents per 100 lb.):

To	Prop.
Scarsdale to Hartsdale, N. Y.	15½
White Plains to Pleasantville, N. Y.	16
Chappaqua to Pawling, N. Y.	16½
Wingdale to Colemans, N. Y.	17
Millerton to Chatham, N. Y.	17½
Nepera Park to Elmsford, N. Y.	15½
East View to Briarcliff Manor, N. Y.	16
Millwood to Tilly Foster, N. Y.	16½

Reason—Proposed rates compare favorably with rates now in force to Brewster, Towners and Millington, N. Y., for N. Y. N. H. & H. R. R. delivery, and Chatham, N. Y., for B. & A. R. R. delivery, as per L. & H. R. Ry. I. C. C. A1789.

18211. **Crushed stone,** carloads (See Note 2), from Pleasant Gap, Penn.:

To Pennsylvania points	Prop.
Howard	80
Pardee Coll. No. 51	185
Ashcroft Coll. No. 34	185
Flemington Co. No. 30 to Penn. Coll. No. 37	185
Penn. Coll. No. 21-22	195
End of Bens Creek Branch	175
Argyle Coll. No. 1	185
East Liberty to Carliss	185
Pittsburgh, So. Side, to end White Hall Br.	185
Federal St., Pittsb., to Butler St., Pittsburgh	185
Verone	185
Oakmont	185
Parnassus to New Kensington	185
Rockview	60
Axemann	60
Youngsville	240
Erie	240
Keating Summit	150
New Bethlehem	240

Rates in cents per 2000 lb.

Reason—Proposed rates are comparable with rates now in force from Bellefonte, Penn., as per P. R. R. G. O. I. C. C. 14487.

18212. **Agricultural, land, chemical, gas or glass lime,** carloads, minimum weight 30,000 lb., also **ground limestone,** carloads, minimum weight 50,000 lb., from Pleasant Gap, Penn., to Nelson Run to Austin, Penn., inclusive, 13c per 100 lb., and from Wharton to Lick Island, Penn., inclusive, 13c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Bellefonte, Penn., as per P. R. R. G. O. I. C. C. 14567.

18213. **Agricultural, land, chemical, gas or glass lime,** carloads, minimum weight 30,000 lb., also **ground limestone,** carloads, minimum weight 50,000 lb., from Ashcom, Penn., to Tyrone, Penn., 8c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Ashcom, Penn., to Cresson, Lilly and Mt. Union, Penn., etc., as per P. R. R. G. O. I. C. C. 14567.

17726, Sup. 1. **Agricultural,** land, chemical, gas or glass **lime,** carloads, also **ground limestone,** carloads, minimum weight 30,000 lb., except on ground limestone, 50,000 lb., from York, Penn., to Elmira, N. Y., 15½c per 100 lb.

17991. **Limestone, unburnt, ground,** carloads, minimum weight 50,000 lb., from Barber, Va., to B. & O. R. R. stations, Washington, D. C., to Point of Rocks, Md., $3.10 per ton of 2000 lb. Reason—Proposed rate is same as now in effect to Baltimore, Md., and points directly intermediate thereto.

17999. **Lime,** building, **agricultural,** land, chemical, gas or glass, carloads, minimum weight 30,000 lb., from Philadelphia stations, Knickerbocker, Howellville, Rambo, Plymouth Meeting, Blue Belt, Union Stone Co., Bainbridge, Rheems, Devault, Temple, Bellefonte, Pleasant Gap, Penn., Baltimore Stations, Md., Texas, Cockeysville, Md., York to York Fair Grounds, Penn., incl., Spring Grove to Hanover, Penn., incl., Littletown, Penn., Union Bridge to Frederick, Md., incl., Campbell to Wrightsville, Penn., incl., Codorus Mills to Emigsville, Penn., incl., Lemoyne, Penn., Falling Waters, Berkeley, Martinsburg and Bunker Hill, W. Va., to Lyndonville to Greece, N. Y., incl., 19c per 100 lb. Reason—Proposed rates compare favorably with rates now in force from Martinsburg, W. Va., to same destinations as per B. & O. I. C. C. 21047.

18003. **Crushed stone,** carloads (See Note 2), from Ashcom, Penn., to Cassleman, Penn., $1.40 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates now in force between points in the same general territory as per P. R. R. G. O. I. C. C. 14287.

18004. (A) **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, (B) **Sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), to Wilmington and New Castle, Del., from Woodbury, Salem, Quinton, Bridgeton, Dorchester, Muskee Siding, Collinswood, Pomona, N. J., (A) $1.40, (B) $1.60; from Absecon, Atlantic City, Belleplain, Ocean City, Stone Harbor, Wildwood Crest and Cape May, N. J., (A) $1.65, (B) $1.85 per ton of 2000 lb. Reason—To establish rates which will be comparable with rates from Lewes, N. J., to Wilmington and New Castle, Del., and from Cape May, N. J., to Birdsboro and Phoenixville, Penn., as per P. R. R. G. O. I. C. C. 14212 and 14435.

18006. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silica, carloads (See Note 2), from Morrisville and Tullytown, Penn., to Douglassville, Penn., $1; Monocacy to Birdsboro, Penn., incl., $1.10, and Reading, Penn., $1.15 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from Philadelphia, Penn., to Phoenixville, Royersford, Pottstown, Penn., etc., as per P. R. R. G. O. I. C. C. 13456.

18018. **Stone (fluxing),** carloads (See Note 2), from Atlas, Hamburg, Lime Crest and McAfee, N. J., to Bayonne City, N. J., $1.51 per ton of 2240 lb. Reason—Proposed rate is same as published to Perth Amboy, N. J., as per L. & H. R. Ry. I. C. C. No. A1795.

18028. **Sand,** carloads (See Note 2), from Masonville to South Pemberton, N. J., incl., to Gibbstown, N. J., 92c per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from Mays Landing, Manumuskin, Dorchester and Belleplain, N. J.

18029. **Sand, common,** carloads (See Note 1), from Port Richmond (Philadelphia) Penn., to Erie Ave. (Philadelphia), Penn., 50c per ton of 2000 lb. Reason—Proposed rate is comparable with rates now in effect on like commodity from and to points in Philadelphia, Penn.

18055. **Crushed stone,** carloads (See Note 2), from Morrisville and Tullytown, Penn., to Eastwicks (Philadelphia), Penn., $1.60 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in effect from Port Richmond and Erie Ave., Penn., as per P. R. R. G. O. I. C. C. 14194.

18060. **Limestone screenings,** carloads, from Ogdensburg, N. J., to Pittstown, N. J., $1.50 per ton of 2000 lb. Reason—Proposed rate is comparable with rates now in force from Ogdensburg to Irvington, N. J., and from Atlas, Hamburg and Lime Crest, N. J., to Pittstown, N. J.

18068. **Crushed stone** (other than bituminous asphalt rock), N. O. I. B. N. in O. C., carloads (See Note 2), and unburned ground limestone, carloads, minimum weight 50,000 lb., from Gouverneur, N. Y., to N. Y. C. R. R. stations, Thompson's, N. Y., to Wentz, N. Y., incl., $1.70; Moreland to Presho, N. Y., incl., $2, and Lindley and Lawrenceville, N. Y.-Penn., $2.30 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from Geneva, Phelps Jct., Coomer, Transit, Schenectady, Clarence Centre and Lancaster, N. Y., as per N. Y. C. R. R. I. C. C. N. Y. C. No. 15402.

Freight Rates on Cement

MATERIAL supply dealers have been notified that on April 14, 1928, a new scale of railroad rates on cement will go into effect in the southeastern territory, the changes being made in order to equalize the rates.

Under the changes in the rates, freight costs will be on a mileage scale, whether the shipments are between points in the southeastern territory or from the north into this territory. For distances of five miles or less the new rates will be 4 cents per 1000 lb., while for 400 miles the charges will be 19 cents. For 1500 miles the charge is 46.5 cents, while intervening distances were given a proportionate rate. As a whole, the new rates will represent a reduction in rates now existing; however, there will be a few minor exceptions, it is announced.

I. C. C. Decisions

20303. Cement Rate Inquiry. The Interstate Commerce Commission on its own motion has instituted an inquiry into rates on cement for hauls of 80 miles and less, as to their reasonableness and lawfulness, in the territory bounded by the following lines: The international boundary between the United States and Canada on the north, the Buffalo-Pittsburgh line, the Ohio River and the Mississippi River south of Cairo, Ill., on the east, the Ohio River, Gulf of Mexico and international boundry between the United States and Mexico on the south, and the western boundary of that portion of Texas, Colorado, Wyoming and Montana in which the so-called 8182 basis of cement rates, or rates related thereto, now applies, on the west.

There have been complaints as to their quality, from both railroads and shippers. The commission has tried to establish rates on short hauls to big consuming markets but has failed in its efforts. Instead of using the scales approved by the commission, some carriers have made the short haul charges on the basis of switching movements. In Texas short haul rates are higher than those prescribed by the commission for interstate application. The Texas rates, however, are not covered by this order, although some rates that come into contact with the Texas adjustment are included.

The basis mentioned in the order is that which was prescribed by the commission in Docket No. 8182, the Western Cement case, also initiated by the commission.

19666. Sand and Gravel. Rate of 90 cents per ton from Jonesville, Mich., to Fort Wayne, Ind., is unreasonable in that it exceeds 75 cents.

19651. Ground Limestone. Rate exceeding $7.48 per long ton, minimum weight 60,000 tons, from Sparta, Tenn., to Paulsboro, N. J., unreasonable. Reparation awarded.

19086. Silica Sand. Santa Fe rates from San Pedro, Wilmington and East San Pedro, Calif., to Los Angeles, Long Beach and Torrance, Calif., not unreasonable and applicable. Handling charges maintained at San Pedro also not unreasonable. Recommended dismissed. Complaint sought to have the silica sand (brought from Belgium via the Panama canal) take the "rock, sand and gravel" rates.

19417. Molding Sand. Rates on molding sand, from Leedy, Miss., to Indianapolis and Noblesville, Ind., Chicago and Abingdon, Ill., and Milwaukee, Wis., are not unreasonable or otherwise unlawful. Dismissal recommended.

I. and S. 2942. Oyster shells. Proposed increases in freight rates on oyster shells to, from and between southern and southwestern points and from Gulf points to northern and other destinations were found not to be justified by the Interstate Commerce Commission. The tariff schedules based on findings in fertilizer case were ordered canceled and the proceeding discontinued.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

A Representative Small Plant

H. A. Spindler Manufactures Wide Variety of Cement Products at His Columbus, Tex., Plant

IN a small town, remote from large centers of population, a concrete products manufacturer must be versatile and ingenious, and the ability to concentrate on mass production of a few standard units is not needed. For while the market is small, it will accept about anything suitable for building purposes that is made of concrete.

H. A. Spindler has a concrete products business at Columbus, Texas, that is a fair illustration of this principle. Columbus is a town of perhaps 1500 people, the county seat of Colorado county, and it lies about 80 miles west of Houston. There are no large places nearby, and he finds his market in Columbus, Eagle Lake and a few other towns, all about the same size, and with the farmers that raise rice and cotton in the surrounding countryside. He makes block, brick, pipe, trimstone and some specialties, no one of them in what would be called large quantities, except perhaps drain tile, for which there is a steady and growing demand.

Columbus is the great sand and gravel center of that part of Texas, and Mr. Spindler buys his raw material, pea gravel and concrete sand, from Horton and Horton, who are regular producers. Neither the pea gravel nor the concrete sand is as high priced as the gravel that is shipped to Houston, to which sand comes in from other sources, so his plant has the advantage of furnishing a small but steady market for what would otherwise be a waste product.

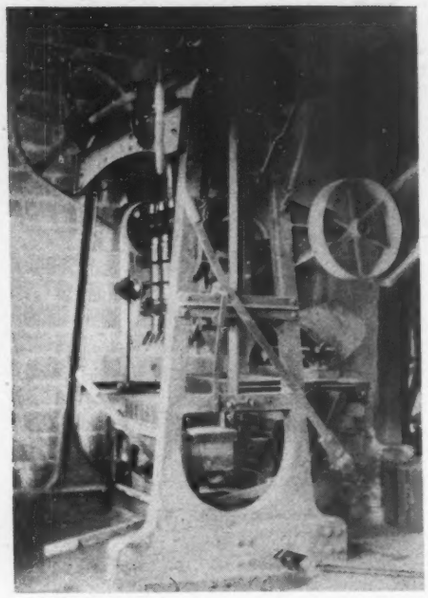
Plant Layout

The plant is a simple one and inexpensively housed, as the climate permits it to be. In fact much of the work is done in the open air. But the curing is mainly done in four steam curing rooms, 50 ft. long and 8 ft. wide, carefully built of concrete block and covered with an arched roof, of wire reinforcing and concrete stucco. The arched roof prevents the water of condensation from falling directly on the green blocks and other pieces.

There are two machines in the plant, a standard Duntile machine and a heavy tamp type brick machine, made by the Concrete Equipment Co. The Duntile machine is used for making block in standard sizes and the smaller sizes of pipe, and it is well adapted to a business of this kind because so many products can be made on it. The brick made on the brick machine are rather a specialty with Mr. Spindler. He makes them with a 5 to 1 mix, which gives them a compressive strength of 2200 lb. Most of the output is of colored brick, and to make these he uses only high grade Dutch colors and puts in 2½ lb. to the bag of cement. The result is a brick that masons as well as house owners like. It is carefully cured and dried out to prevent shrinkage in the wall, and while it

Yard at the Spindler plant where pipe and trimstone are cast and brick is manufactured

Footings and cement blocks in the yard at the plant of H. A. Spindler



Machine used for making concrete brick

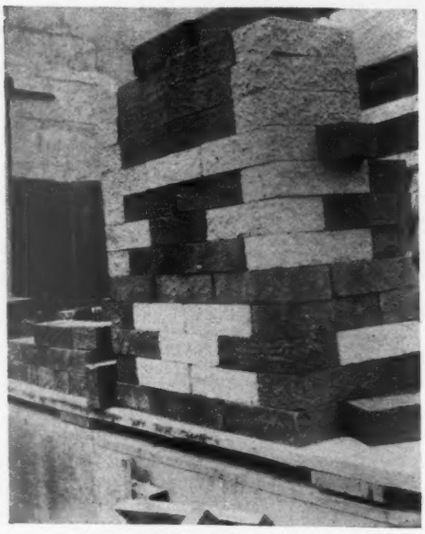
cuts a little harder than a common brick it will always cut square.

Pipe Manufacture

Drain tile are made in 14-in. lengths on the Duntile machine and are sold in large quantities to farmers, as much of the land in that section must be underdrained. It is usually sold and shipped in car lots. Another product that sells well to the farmers is 36-in. concrete pipe, used by them for lining wells. The wells are dug through the gravel land, which comprises the greater part of the surrounding territory, and lined with these pipes to prevent the gravel from caving from the sides. Mr. Spindler has devised an ingenious clamp for lowering these pipes into position from the surface. He lends it to the farmer who buys well lining from him and shows him how to use it, and the little device has had quite an influence in making a market for pipe of this size.

All pipe larger than the 5-in. and 6-in. drain tile, made on the machine, are cast by hand in the yard. The yard has a ½-yd. Jaeger mixer, bins for coarse and fine aggregates and a small boom derrick and winch for placing molds and the like. The equipment is simple but it is effective, and it does not require much labor to keep the operation going. A considerable part of the pipe output is sold to counties and municipalities for culverts and drains. The larger sizes are all reinforced.

Trimstone, some of it in color, urns and other lawn and garden ornaments are made in the yard by the usual methods of hand casting and are finished by scrubbing with acid. Mr. Spindler exhibited some urns in colored concrete that he was holding for a test of the fastness of certain coloring material. They had been exposed to the weather for two years and looked fresh and bright still. Some special shapes of coping blocks and the like have been worked out to go with ordinary block construction and they sell well.



Types of concrete brick showing various textures

Device which sells much concrete well curbing

Products Used Only in Good Construction

He has studied the uses of his product no less than its manufacture and tries to see that his block and brick are used only in good construction. He has a strong conviction that buildings of block should have lintels and sills of reinforced concrete and

New boiler house, under construction, showing concrete collar above the door

Smooth-surfaced concrete brick which will cut square, in the yard of the Spindler plant

a collar of reinforced concrete at the top of the wall, not only to serve as a plate but to hold the building together. The new boiler house he was building when the plant was visited is of this construction and the picture shows the collar of reinforced concrete (above the opening for the boiler), the height being that of the back wall.

Recently Mr. Spindler had a chance to compare the cost of concrete block and wood construction in his locality, where lumber is not expensive. One builder put up two five-room houses alike in every respect except the materials. The concrete block house cost $350 more than the wooden house, but this cost was more than made up by the difference in the cost between the wooden shingles used on the frame house and the asbestos shingles used on the concrete block house. Several good structures have recently been put up of his block in Columbus, including a very large garage. The walls of this and some other structures were left unfinished, the color being a pretty "warm" gray, sufficiently uniform in tint to keep it from looking patchy.

As would naturally be expected, Mr. Spindler is a close student of whatever is developed in the concrete field and a regular reader of ROCK PRODUCTS and other magazines devoted to the concrete industry. A son, who is attending high school, shows an equal interest in concrete and its possibilities and puts in much of his spare time working in the plant.

Ohio Concrete Products Men Meet

THE eighth annual convention of the Ohio Concrete Products Association was held recently at the Gibson Hotel in Cincinnati. The meeting was well attended and the delegates made an enthusiastic representation. A good portion of the meeting was given over to talks by building commissioners of various Ohio cities, each talk being followed by a general discussion in the meeting. Fred McMinn, assistant building commissioner of Cincinnati, told of the co-operation they had from the local association and stated he was always glad to answer questions in regard of proposed legislation. Sam Roberts, assistant building commissioner of Columbus, read the names of the Columbus manufacturers and results of their latest tests, all of which were above the 1000-lb. requirement. Mr. Roberts also praised the co-operation given to the building department by the Columbus local. L. C. Gamble, building commissioner of Toledo, said that he was for modern ordinances that would regulate the quality, not only of concrete products, but also clay products. Marion Hay, building commissioner of Dayton, said that they were by no means satisfied with the building code just adopted. He realized that the Board of Review that they hoped to create would have a large number of problems to cope with, and said that he felt the manufacturers were not co-operating. W. D. M. Allen, of the Portland Cement Association, also talked to the convention.

All of the previous officers of the association were re-elected. S. I. Crew, of Cincinnati, is president; F. A. Owen, of Akron, is vice-president, and G. M. Friel, of Columbus, is secretary-treasurer.

Belgians Plan Manufacture of Cast Stone to Use Excess Cement

ACCORDING to the consular report of William C. Burdett, at Brussels, Belgium, the local association of cement makers, L'Union des Cementaries, is making a survey to determine how the seasonal decline in the demand for cement during the winter months may be counteracted. In conjunction with the Auxiliaire des Cimentaries, an organization formed of some of the members of the larger group, the Union has brought out a plan for the manufacture of artificial stone throughout Belgium, and it is hoped that by the production of this substitute for building stone enough cement will be used to equalize the present varying demand.

Intensive laboratory tests have already been completed and plans for the production of the product are going forward. The report states that the new blocks will be made with varying amounts of cement in the mix, the higher percentage to be used where greater strength is necessary. The stone is to be cast in the shape required, to eliminate the necessity of cutting, although it will be possible to cut the product if desirable. Blocks have been tested with various coloring materials added, and have proved satisfactory. If this European experiment is favored by the architects of Belgium and the surrounding countries, it is quite probable that it will have a good effect in stabilizing the Belgian cement demand, and it is even possible that it will reduce the shipments of Belgian cement exported to the United States and other countries.

Two Indianapolis Products Companies Merge

A CONSOLIDATION of two Indianapolis cement products firms, the Straub Cinder Block Co. and O. L. Miller and Co., has recently been completed and the new firm will be known as the Cinder Block and Material Co. The plant and office will be at 2260 Montcalm street, where new machinery is being put in. The officers say the plant will be one of the most modern and up-to-date plants in the country, with a capacity of 8000 blocks a day. Equipment obtainable for making cinder and gravel blocks of best quality and uniformity has been chosen, it was said. Hollow 3- and 4-in. partition tile of cinder concrete will be made. The ground space acquired will permit the storage of 500,000 blocks and a new warehouse with storage space for building material is being completed.

O. L. Miller, who established O. L. Miller and Co. in 1906, is president of the new firm. E. W. Klatte, formerly manager of the Straub Cinder Block Co., is sales manager, and Allen C. Miller is manager.—*Indianapolis* (Ind.) *News.*

Gravel-Pit Frog Story of Fish Story Quality

A NEW ORLEANS man, visiting in Dallas recently, brought to the city the story of the discovery in Frederick, Tillmann county, Okla., of a frog, excavated alive from a tomb of solid limestone rock, which for age makes the Eastland horned toad, with his 31 years of sequestered existence in the courthouse corner stone, a mere infant by comparison. Furthermore, the story of the Frederick frog appears to be even more completely authenticated than was that of the Eastland toad. Facts of the discovery of this and other frogs in Tillman county are testified to by affidavits of the owner of the land from which the frogs were taken, by an affidavit of a prominent physician of the community, and by yet another sworn statement from the president of one of the town's banks.

A. H. Holloman is the owner of the land where the excavations which uncovered the several frogs mentioned are being made. He testifies that on or about February 20 he found in a gravel pit a frog, which was completely enclosed in a spherical shaped rock of sand and clay, without any aperture whatever; that he personally broke open the rock and took therefrom the frog, which, while blind, with its mouth grown together, was still alive and almost transparent. The rock containing the frog was found at a depth of about 20 ft. and beneath a limerock formation about 2 ft. in thickness.

The physician's affidavit tells of the finding of this and other frogs, some of which, when exposed to the air, swelled until they burst, due to the change in atmospheric conditions, apparently absorbing air through pores of the skin faster than it could be exhaled, because of the closed respiratory passages.

These frogs were found in a gravel formation where Dr. J. D. Figgins, director of the Colorado Museum of Natural History, and Dr. Harold J. Cook, honorary curator of natural history of the same institution, have heretofore found many fossils and bones of animals dating back to perhaps 150,000 years.

Thus the inference can be drawn that the frogs found may have had their birth in the dim ages of antiquity, were sealed in their stony cells by changing geological processes, eventually to be unearthed for the puzzlement of latter day scientists. At any rate, the Holloman frogs appear ancient by comparison with the Eastland horned toad.—*Dallas* (Tex.) *News.*

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	.....	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Mo.	.50@ .75	1.35@1.45	1.15@1.25	1.10@1.20	1.05@1.15	1.05@1.10
Ft. Spring, W. Va.	.35	1.30	1.30	1.25	1.20	1.15
Munns, N. Y.	1.00	1.50	1.50	1.50	1.25	.....
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.80	1.50	.....	.95	.90	.....
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.50	.50	.50	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	.90@1.25	.80@1.35	1.00@1.35	.90@1.35	.90@1.35	.....
Cypress, Ill.	1.25	1.15	1.10	1.00	1.00	1.00
Dubuque, Iowa (h)	.80	1.40	1.40	1.40	1.35	1.35
Greencastle, Ind.	1.25	1.15	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa (f)	1.10	1.55	1.55	1.35	1.45	1.45
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.....	.....	1.20	1.10	1.00	.....
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90@1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.....	.90	.90	.90	.90	.90
Wisconsin Points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	.....
Chico, Texas	1.00	1.30	1.25	1.20	1.10	1.05
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Graystone, Ala.	Crusher run, screened, $1 per ton					
Kendrick and Santos, Fla.	3½ in. and less, $1 per ton					
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis Co., Mo. (p)	1.25	1.25	1.00	1.00	1.00	1.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90@1.00	2.25	1.75	1.55	1.25	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	.....
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35@1.40	2.00@2.10	1.80@1.90	1.40@1.50	1.40@1.50	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.75	1.10	1.10	1.10	1.10	.....
Springfield, N. J.	2.00	2.10	2.10	1.60	1.60	.....
Toronto, Canad (m)	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.	.50	1.75@1.90	1.75@1.90	1.75@1.90	1.60@1.75	.....
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	.....	2.35	.....	.....	.....
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	.....	.....	1.50 to 1.85			
Toccoa, Ga.	.....	.....	1.30	1.25	1.20	1.20

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.40. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery. (n) Crusher run for ballast, .80. (p) Carload prices. (q) Crusher run, 1.40; screenings for ¼-in. granolithic finish, 3.00.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 200 mesh	6.00
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh	5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 50% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50 mesh	1.50
Pulverized, per ton	2.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; all sizes	1.25
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk	2.70
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis 99.05% $CaCO_3$; 90% thru 50 mesh	6.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 97%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50

Agricultural Limestone

(Crushed)

Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$; 1%, $MgCO_3$; 90% thru 10 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — 50% thru 100 mesh 1.50

Danbury, Conn.; Adams, Ashley Falls and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 5% $MaCO_3$; 90% thru 50 mesh, bulk 3.50
100-lb. paper bags 4.75
100-lb. cloth bags 5.25
(All prices less .25, 15 days.)

Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh.... 1.00

Ft. Spring, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh 1.00

Kansas City, Mo. — 50% thru 100 mesh 1.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼ in. to dust) 1.00

Linwood, Iowa—Analysis, 98% $CaCO_3$, 1.10% or less $MgCO_3$; 100% thru 4 mesh 1.10
50% thru 50 mesh 1.10
100% thru 20 mesh, sacked, sacks extra 9.00

Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00

McCook, Ill.—90% thru 4 mesh ..... .90

Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh 1.50

Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags 5.00

Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75

Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh 2.35

Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh ..... .90@1.50

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk 3.00

Joliet, Ill. — Analysis, 50% $CaCO_3$; 42% $MgCO_3$; 95% thru 100 mesh; paper bags 3.50

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks 4.25

Piqua, Ohio, sacks, 4.50@5.00; bulk.. 3.00@ 3.50

Rocky Point, Va.—85% thru 200 mesh, bulk ..... 2.25@ 3.50

Waukesha, Wis.—90% thru 100 mesh, bulk 4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J. ..... *1.75@ 2.25
Estill Springs and Sewanee, Tenn. 1.50
Franklin, Penn. 2.00
Klondike, Mo. 2.00
Massillon, Ohio 3.00
Michigan City, Ind. ..... .35
Ohlton, Ohio 2.50
Ottawa, Ill. 1.25
Red Wing, Minn. 1.50
San Francisco, Calif. ..... 4.00@ 5.00
Silica, Va. 2.00
St. Louis, Mo. 2.00
Utica and Ottawa, Ill. ..... .75@ 1.00
Zanesville, Ohio 2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	.65@1.00
Estill Springs and Sewanee, Tenn.	1.35@1.50	1.35@1.50
Ohlton, Ohio	1.75	*1.50
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	*1.50
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N.J.	.65	.55	1.00	1.35	1.40	
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05		1.05
Erie, Penn.	.60	1.45			1.40	
Machias Jct., N. Y.	.85	.65	.65		.65	.65
Montoursville, Penn.	1.00	.80	.75	.65	.65	.60
Northern New Jersey	.50	.50	1.25		1.25	
Portland, Me.	1.00	1.00	2.50		2.25	
Somerset, Penn.		2.00				
Washington, D. C.	.60@ .85	.60@ .85	1.70	1.50	1.30	1.30
CENTRAL:						
Attica, Ind.			All sizes .75@.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.25@ .80	.50@ .70	.10@ .40	.50@ .70	.60@ .80	.60@ .80
Barton, Wis.		.55	.75	.75	.75	.75
Chicago District	1.30*@1.50*‡			1.50*@2.00*‡		.25*
Columbus, Ohio¶		.85	.85	.85	.85	
Des Moines, Iowa		.40		1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.50	.50	.65		.95	
Elkhart Lake, Wis.	.60	.50	.40	.56	.50	.50
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		1.00	1.00		1.00	
Hersey, Mich.		.50		.60	.70	.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Mankato, Minn.		.45g		.60@1.25h	.70@1.25	1.25e
Mason City, Iowa		.50	1.25	1.25	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.65*	.65*	1.75*	1.75*	1.75*	1.75*
St. Louis, Mo.	1.20e	1.45f	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35		1.25	1.25	1.25
Terre Haute, Ind.	.85	.85	.85	.85	.85	.85
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.15	1.10
SOUTHERN:						
Brewster, Fla.			3.00			
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.	.45@ .50					
Ft. Worth, Texas	1.09	1.09	1.00	1.25	1.25	1.25
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.10
Macon, Ga.	.50	.50				
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.25	.15	1.25	.85	.45@ .65	
WESTERN:						
Kansas City, Mo.	.70	.70@ .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@ .40	.10@ .40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Otay, Calif.		.35@ .50	.60	.60	.60	.60
Phoenix, Ariz.	1.25	1.00	1.50	1.25	1.10	1.00
Pueblo, Colo.	.80	.60		1.20		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Burnside, Conn.		.75				
Des Moines, Iowa	.60					
Dresden, Ohio	.60@ .75	.70	.60	.80	.75	.65
Eau Claire, Chippewa Fls., Wis					.65	
Ft. Worth, Texas						.80
Gainesville, Texas						.55
Grand Rapids, Mich.					.50	
Hamilton, Ohio					1.00	
Hersey, Mich.					.50	.50
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.		1.85@2.00		1.50@1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Washed and screened river sand. (h) ¾-in. to ¼-in.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.50	2.75	1.75		4.00	
Beach City, Ohio	1.75@2.00	1.75@2.00		1.75	1.75@2.00		
Dresden, Ohio	1.50@1.75	1.25@1.50	1.50@1.75	1.25			
Eau Claire, Wis.						3.00	
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10@1.50	1.25@2.00	2.00			2.75@3.00	
Klondike, Mo.				2.00	2.00		2.00
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30@ .35			
Montoursville, Penn.				1.35@1.50			
New Lexington, O.	2.25	1.25					
Ohlton, Ohio	1.75	1.75		2.25	1.50	2.00b	1.75b
Ottawa, Ill.	1.25	1.50	1.25	3.25	1.25	3.50	2.00
Red Wing, Minn.(d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.	Pottery sand, 8.00@12.00						
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*2.00	1.50*@2.00	1.75	1.50*@2.00	1.50*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (b) Damp. (c) Shipped from Albany. (d) Filter sand, 3.00. (e) Filter sand, 3.00@4.25. (f) Crude and dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95[4]
Chazy, N. Y.		8.50	7.50	10.00		15.50[1]	8.50	14.00
Lime Ridge, Penn.							5.00[2]	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.			8.50@9.50		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50@9.50[7]	8.50@9.50[7]	8.50@10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.							7.80	1.35
Carey, Ohio	11.50	7.50	7.50		9.00		8.00	1.50
Cold Springs, Ohio		8.50	8.50				8.00	
Gibsonburg, Ohio	11.50				9.00	11.00		
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio[6]	11.50							
Milltown, Ind.		8.50@10.00		10.00[8]			8.50[22]	1.35[10]
Scioto, Ohio		8.00	8.00	8.50	8.25	.62½	7.50	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	8.50	8.50	12.50	8.00	10.00[9]	9.00	1.50[3]
SOUTHERN:								
El Paso, Texas							7.00	
Frederick, Md.		8.00@9.50	8.00@9.50			9.50[15]	7.00[15]	
Graystone, Ala.	12.50	10.00		12.50		1.40[14]	8.50	1.50
Keystone, Ala.		10.00	8.00	10.00	8.00		8.00	1.50
Knoxville, Tenn.	20.25	8.50	8.50	8.50			7.50	1.35
Ocala, Fla.		10.00	9.00				10.00	1.40
WESTERN:								
Cirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Los Angeles, Calif.	16.00		16.00	16.00			16.00	
San Francisco, Calif.	20.00	20.00	13.50	21.00			14.50[20]	2.15
Tehachapi, Calif.[13]	17.00	15.00	12.00@15.00[11]	17.00	16.00		16.00	2.00
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] 180 lb. [6] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] To 1.50. [11] Refuse or air slack. 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [14] Per 2 bags of 90 lb. each. [15] To 8.00. [22] To 9.00. [20] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Utica & Ottawa, Ill.	1.00@ 3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel crayons, gross	1.00@ 2.80
Chatsworth, Ga.:	
Crude talc, grinding	5.00
Ground talc (150-200 mesh)	7.00@10.00
Pencils and steel crayons, per gross	1.00@ 1.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	9.00@ 9.50
Same, burlap bags, bags extra	8.00@ 8.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc (for grinding)	5 00
Ground talc (150-200 mesh), bags	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Glendon, N. C.:	
Ground talc (150-200 mesh), bulk	6.00@10.00
Ground talc (150-200 mesh), bags	8.00@14.00
Pencils and steel crayons, gross	1.05@ 2.00
Blanks, .08 per lb.; cubes	50.00
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.00
Ground talc (150-200 mesh), bags	8.50@14.75
Joliet, Ill.:	
Ground talc (150-200 mesh) in bags:	
California white	30.00
Southern white	20.00
Dark	10.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50@ 4.50
Gordonsburg, Tenn.—B.P.L. 65-70%	3.75@ 4.00
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00

Ground Rock

(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72.5%	9.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50@24.00
Roofing mica	37.50
Punch mica, per lb.	.12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt. — English pink, English cream and coral pink	*12.50	*12.50
Brandon grey	*12.50	*12.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar		9.00@10.00
Easton, Penn.—Green stucco		12.00@18.00
Green granite		14.00@20.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash		11.00@18.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		4.00@ 5.50
Phillipsburg, N. J.—Royal green granite		15.00@18.00
Randville, Mich.—Crystalite crushed white marble, bulk	4.00	4.00@ 7.00
Rose pink granite, bulk		12.00
Stockton, Calif.—"Natrock" roofing grits		12.00@20.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	
Warren, N. H.		¶7.90@‖8.95
Wauwatosa, Wis.		10.00@15.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 16.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.
¶C.L. ‖L.C.L.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 40 mesh to 200 mesh	15.00@28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50; bulk	11.50
Pulverized, 95% thru 200 mesh; bags, 19.73@23.50; bulk	18.73@22.50
Pulverized, 20% thru 80 mesh; bags, 16.75@22.00; bulk	15.75
"Imperial" feldspar, 200 mesh; bags, 23.50; bulk	22.50
"Riverside" spar, 200 mesh; bags, 17.60@20.00; bulk, in quantity	13.65
20% thru 80 mesh; bags, 17.60@20.00; bulk, in quantity	13.65
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18 20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; Si_2O, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk	18.00
Crude	9.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O_3, 3%; 68% SiO_2; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich. (Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass. (Limestone)	‡7.50@*9.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton, including sacks	15.00
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	10.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	13.00@16.00*
Farmington, Conn.	13.00
Flint, Mich.	¶11.50@19.00c
Factory jobs, f.o.b. plant, net	13.25
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00@18.00*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	16.00*
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50b
San Antonio, Texas	16.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	18.00@20.00
Toronto, Canada	13.50@16.00*†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M, 10th of month. (b) Red, $16. (c) Less than 2000, 5% discount, delivered; more than 2000, 10% and 5% discount, delivered.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.		2.35
Baltimore, Md.		2.15‡@2.25
Birmingham, Ala.		2.10
Boston, Mass.		2.13@2.23
Buffalo, N. Y.		2.00‡@2.10
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa		2.24
Charleston, S. C.		2.35
Cheyenne, Wyo.	.82¾	3.31
Chicago, Ill.	.51¼	2.05
Cincinnati, Ohio		2.22
Cleveland, Ohio		2.24
Columbus, Ohio		2.22
Dallas, Texas		2.00
Davenport, Iowa		2.24
Dayton, Ohio		2.24
Denver, Colo.	.66¼	2.65
Des Moines, Iowa		2.05
Detroit, Mich.		1.90
Duluth, Minn.		2.04
Houston, Texas		2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.		2.10
Jacksonville, Fla.		2.20
Jersey City, N. J.		2.03‡@2.13
Kansas City, Mo.		1.92
Los Angeles, Calif.	.60	2.40
Louisville, Ky.	.55½	2.22
Memphis, Tenn.		2.10
Milwaukee, Wis.		2.20
Minneapolis, Minn.		2.12@2.22
Montreal, Que.		1.86
New Orleans, La.		2.07
New York, N. Y.		1.93‡@2.03
Norfolk, Va.		2.07
Oklahoma City, Okla.		2.46
Omaha, Neb.		2.36
Peoria, Ill.		2.22
Philadelphia, Penn.		2.11‡@2.21
Phoenix, Ariz.		3.26
Pittsburgh, Penn.		2.04
Portland, Colo.		2.80
Portland, Ore.		2.40‡@2.60
Reno, Nev.		2.91
Richmond, Va.		2.24‡@2.34
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.		2.21
Savannah, Ga.		2.50
St. Louis, Mo.		1.95
St. Paul, Minn.		2.12@2.22
Seattle, Wash.		2.50†@2.65
Tampa, Fla.		2.25
Toledo, Ohio		2.20
Topeka, Kan.		2.41
Tulsa, Okla.		2.33
Wheeling, W. Va.		2.12
Winston-Salem, N. C.		2.44

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Buffington, Ind.		1.80
Chattanooga, Tenn.		2.45*
Concrete, Wash.		2.35
Davenport, Calif.		2.45*
Hannibal, Mo.		1.90
Hudson, N. Y.		1.75
Leeds, Ala.		1.85
Lime and Oswego, Ore.		2.50‡
Mildred, Kan.		2.35
Nazareth, Penn.		2.15
Northampton, Penn.		1.75
Richard City, Tenn.		2.05
Steelton, Minn.		1.85
Toledo, Ohio		2.20
Universal, Penn.		1.80

NOTE—Add 40c per bbl. for bags.
*Includes sacks.
†10c discount, 10 days. ‡10c discount, 15 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	¾x32x 36". Per M Sq. Ft.	Wallboard, ⅜x52 or 48". Lengths 6'-10'. Per M Sq. Ft.
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u					11.70u			
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50			13.50			
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.					14.30o	12.30m		m9.00@11.00o					
Delawanna, N. J.								7.25			13.00	14.00	
Douglas, Ariz.			6.00	14.50	15.00		18.00		30.00				
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50		24.55	20.00			
Gypsum, Ohio	3.00	4.00	6.00	7.00	9.00	9.00	19.00	7.00	24.50	19.00		15.00	25.00
Los Angeles, Calif.			7.50@9.50	11.50y									
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00		20.00	30.00
Portland, Colo.				10.00									
San Francisco, Calif.			9.00	13.40	14.40		15.40						
Seattle, Wash.	6.60	10.00	10.00	13.00									
Sigurd, Utah									21.50				
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00					20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
(m) Includes paper bags; (o) includes jute sacks; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	16.00	.....	.....
Detroit, Mich. (d)	.16	.....	.18
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	15.00*	.....	.....
Graettinger, Iowa	.16@ .18	.....	.....
Indianapolis, Ind	.10@ .12a	.....	.....
Los Angeles, Calif.	4x8x12—5.00*	4x6x12—4.20*	
Oak Park, Ill.	18.00	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18@ .20	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

	Chocolate, Red, Yellow, Gray, and Orange	Green, Blue
Camden and Trenton, N. J.—8x12, per sq.		
Red		15.00
Green		18.00
Chicago, Ill.—Per sq.		20.00
Cicero, Ill.—Hawthorne roofing tile, per sq.		
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35

†Price per square.

Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich.:	Per 100
5x8x12	5.00
Columbus, Ohio:	
5x8x12	6.50
Grand Rapids, Mich.:	
5x8x12	8.00
Longview, Wash.:	
4x6x12	5.00
4x8x12	6.25
Mt. Pleasant, N. Y.:	Per 100
5x8x12	78.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Clinker	11.00	.....
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	20.00@32.00
Mt. Pleasant, N. Y.	.....	14.00@ 23.00
Oak Park, Ill.	.....	37.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@ 55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.00@ 25.00
Rapid City, S. D.	17.00	25.00@ 35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.	15.00 per ton																
Grand Rapids, Mich.	4 in. to 12 in., 72% off standard sewer price list; 15 in., 65% off; 18 in. to 24 in., 62% off; 27 in. to 36 in., 60% off																
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.	Sewer pipe 40% off list; culvert—list																
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.	6 in. to 24 in., $18.00 per ton																
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.	12.00 per ton																
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.70	.....	2.00	.....	2.75	3.40	.....	6.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Yakima, Wash.							1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

(a) 24-in. lengths; (b) Reinforced.
†21-in. diam. ‡Price per 2-ft. length.

Recent Contract Prices for Rock Products

CONTRACTS recently let or bids received for rock products materials are as follows:

Portland, Ore.—County highway commissions have let contracts for 500 cu. yd. concrete sand, Star Sand Co., 58 cents a yard; 5000 cu. yd. crushed and screened pit run gravel, Bell Sand & Gravel Co., 50 cents a yard; 3500 cu. yd. pit run screened gravel, Cascade Investment Co., 46 cents yard; 2000 cu. yd. washed pea gravel, Portland Sand & Gravel Co., 50 cents yard; 3500 cu. yd. pit run screened gravel, Portland Sand & Gravel Co., 50 cents yard. Contract for furnishing 5000 cu. yd. of crushed rock was awarded by the county commissioners to the Star Sand Co., low bidder, at $1.54 per yard.

C. C. Cate & Co., brokers and importers, were the low bidders for furnishing portland cement to the city purchasing agent. They quoted a figure of $2.65 per barrel for furnishing 5000 bbl. f. o. b. docks or warehouse in cloth sacks, with a refund of 10 cents per sack or 40 cents per barrel for the return of sacks in good condition. An alternate bid of $2.30 per barrel was quoted for furnishing the cement in paper sacks. The Oregon Portland Cement Co. and the Beaver Portland Cement Co. submitted similar bids of $2.90 per barrel, f. o. b. warehouse, with an allowance of 10 cents each on the sacks if returned.

Spokane, Wash.—J. Frese, of the Monroe Sand & Gravel Co., was awarded the contract by the city council for supplying gravel to the city asphalt plant during 1927 at $1 a cubic yard. After the contract was awarded a letter was received at the city hall from Mr. Frese announcing that he would supply free to the city, waste material at the gravel pit for which it had been paying 35 cents a cubic yard. He agreed to supply 20 cu. yd. a day and where an amount in excess of this is wanted the price will be 35 cents a cubic yard.

Dallas, Tex.—Over $5000 worth of stone and gravel was ordered purchased upon competitive bids. The Trinity Farm Gravel Co. was awarded an order for 3000 yards of gravel at a price of $4,500 ($1.50 per yard). The Chico Stone Products Co. will sell 950 tons of stone at a price of $1,237 ($1.30 per ton). All of this material will go into street work.

Recent Contract Prices for Rock Products

(Continued from previous page.)

Aberdeen, Wash.—The city council awarded the cement contract to the Building Materials Co., Inc., of Grays Harbor, for Washington cement, which had submitted a proposal of $3.11 per barrel. The local bid was for domestic cement, whereas a bid of $2.79 submitted by the Stoneway Dock Co. was for the Belgian product.

Ironton, Ohio—Ambrose Dillon, state highway superintendent for this district, received bids for furnishing 7000 cu. yd. of limestone at various county points for the maintenance of state highways. The tabulation indicated that G. W. Bazell's bid of $2.69 per cu. yd. for the furnishing of 2000 yd. at Andis was low for that section. At Aid the bid of George Whitrock of $2.51 was low for the furnishing of 3000 yd. there. Frank Miller bid $1.83 for furnishing 2000 yd. between Wilgus and Arabia and was low.

Chile Increases Tariff on Cement

THE CHILEAN Senate has passed the recently proposed tariff revision which raises the duty on several items, among them being cement. The new tariff on cement is 4 pesos (about 49 cents) against the old rate of 3.60 pesos (about 44 cents) per 100 kilos (225 lb.). It is expected that approval of the new rate will be made by the Chamber of Deputies, after which it will be effective within a month after passage.—*U. S. Commerce Reports.*

British Government to Issue Abstracts of Building Science Papers

A NEW monthly publication of interest to those concerned in building construction and allied subjects is to be issued shortly by the Department of Scientific and Industrial Research of the British government. The purpose of the bulletin is to provide the building industry with up-to-date summaries of the latest developments in the science and practice of building throughout the world. The new publication will be known as *Building Science Abstracts*, and will be similar in scope and service to the two periodicals already being issued, *Biological Abstracts* and *Chemical Abstracts*.

In this periodical all the more important articles appearing all over the world relating to building will be abstracted by the staff of the Building Research Station at Watford. The abstracts are classified under the following headings: stone, mineral earths, clay and ceramics; lime, plaster and chemical compositions in general; cement and concrete; metal; organic building materials; paint and varnish; materials in general, their properties and testing; elements of structures; housing and domestic engineering; specialized construction.

Southern Pacific Renders Service to Western Mineral Producers

AN interesting service is being rendered by the Southern Pacific Railroad through a survey being made by its Mineral Service Bureau. This bureau has undertaken the task of collecting all data possible on metallic and nonmetallic minerals throughout the territory which the road serves, and is at present in a position to plan this information at the disposal of any potential user of any of the products. The bureau has also co-operated with owners of all kinds of deposits throughout the west, in an effort to obtain a good market for the material of the deposit. To do this, lists of producers are sent regularly to a long mailing list of manufacturers all over the country. Each list contains only the information on the particular product that the user is interested in, and supplies data on location, availability, and quality of the deposit. Through this service producers of both metallic and nonmetallic minerals all over the west are certain to be aided in the marketing of their products. To further the work, exhibits at various large expositions in cities in the east and middle west have been made, and in this way a considerable amount of publicity has been obtained. The service has also been aided considerably by the co-operation of state mining bureaus, chambers of commerce, and similar agencies.

Exhibit of the Southern Pacific R. R. showing the rock products of the west

Analysis of Stripping Methods by Sand and Gravel Producers

THIS ANALYSIS was made, first, to determine the producers who have a stripping problem, and, second, to ascertain the methods used.

Tabulation was made of the reports of 410 companies operating in 41 states. Selection was made at random, and should be fairly representative of the entire industry. Many of the companies operate more than one plant, or pit.

Of the 410 companies, 233 (or 56.8%) report stripping operations.

Of the 233 companies, many use a combination of several methods of stripping, or different methods at various plants. In general, however, the manner in which stripping is accomplished is divided as follows:

Use power shovels, disposal by truck or dump wagon, or method of disposal not stated	73
Use power shovels, disposal by locomotives and cars	8
Use power shovels and tractors	4
Use draglines, sidecasting, or method of disposal not stated (many draglines are convertible type)	45
Use draglines, disposal by locomotives and cars	4
Use crawler cranes (many are convertible type)	9
Use cranes and locomotives and cars	1
Use excavators or skimmers (Keystone type or similar)	6
Total using power shovels, or similar machines	150
Use scrapers of various types drawn by teams, or just report using teams	36
Use tractors, or tractors and scrapers	28
Use power drag scrapers, or cableway (Sauerman, etc.)	5
Use power loader and dump wagons	1
Use derrick	1
Use hydraulic method of stripping	1
Use hand methods	6
Stripping contractor to outside parties	5
Total companies reporting stripping operations	233

This investigation refers only to the stripping operations of sand and gravel producers, and has no bearing on the use of similar equipment elsewhere in their operations by these companies.

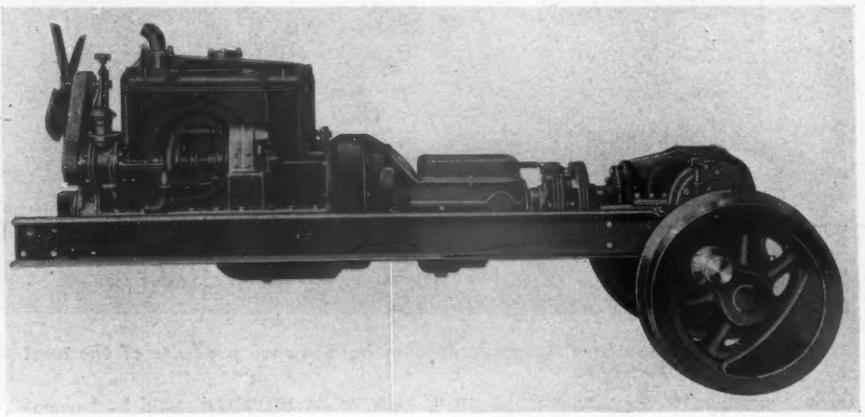
Lehigh Portland Registrar Named

THE Seaboard National Bank has been appointed registrar of the common stock having a par value of $50 of the Lehigh Portland Cement Co. of Allentown, Penn., according to a recent report in the *Financial Chronicle*.

New Machinery and Equipment

New Type Gasoline Locomotive

H. K. PORTER CO. of Pittsburgh, Penn., has brought out a new gasoline locomotive which is claimed to be entirely new in design and to embody an original drive principle. On this locomotive the power plant, clutch and transmission are mounted on a steel sub-frame and form a straight-line drive to the reverse unit. This sub-frame acts as a torque arm pivoted on the rear axle and spring-suspended at the front to the main frame. By a special arrangement the weight of the rear end of the sub-frame is carried on the main frame by a coil spring. The result is that all the vital parts of the locomotive, namely, the engine, radiator, clutch transmission and reverse unit, are mounted to a sub-frame which is spring-suspended to a spring-suspended cross-equalized main frame. The illustration shows the complete power plant and transmission as mounted on the sub-frame, patent for which is pending. The main frames and bumpers are made of rolled steel slabs the same as used on the Porter steel works locomotives. The running gear, including steel-tired driving wheels, side rods, driving boxes, shoes, wedges, springs, etc., is the same as on the Porter steam dinkey.

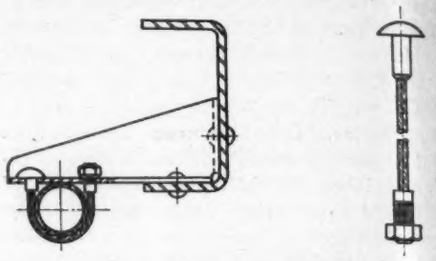


Power plant of new gasoline locomotive

New Flexible Bolt

THE AMERICAN CABLE CO. of Chicago has developed a new flexible bolt for use in the many places in and around plants or mills where rigid U-bolts are impracticable.

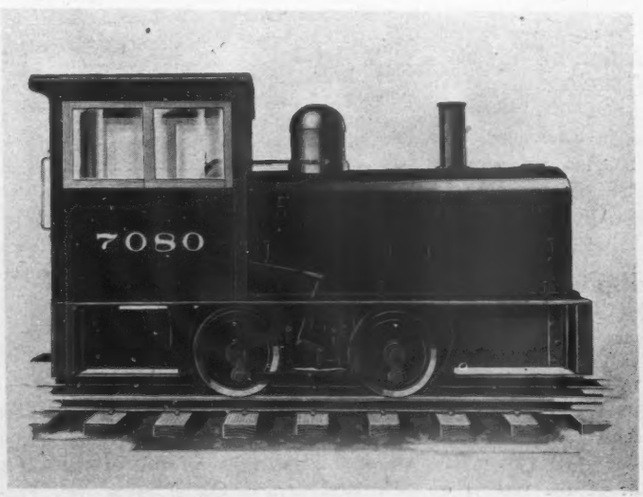
The principle on which the new "Tru-Lay-Tru-Lock" flexible bolt rests is the preformed type of wire rope used. Preforming the wires and strands to the helical shape they must assume in the completed rope results in a cable that does not require seizing but may be cut like a rod, according to the manufacturers. This type of rope permits a close fitting attachment to be slipped over the unseized end of the rope and to be processed so that the steel of the fitting flows into the interstices of the rope and thus becomes practically an integral part thereof, the makers claim. Such fittings can be threaded for a nut or capped for a head. The flexible bolt which has resulted from these developments is available in varying lengths.



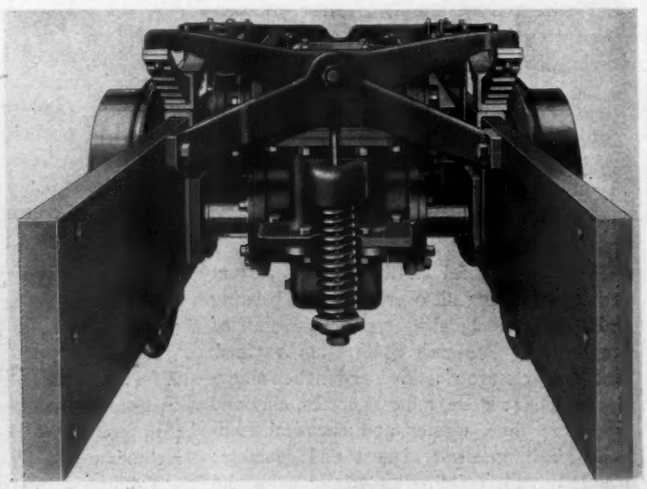
New flexible bolt

Reorganization of Mid-West Locomotive Works

FLOYD C. WILLIAMS has been appointed receiver for the Mid-West Locomotive Works, Cincinnati, Ohio, of which W. C. Armstrong is proprietor. The receivership is a friendly proceeding to protect Mr. Armstrong's interests. Under the order of the court the Mid-West Locomotive Works' plant will be operated as it has been, under H. R. Sykes, as manager, to be known as the Mid-West Locomotive Sales Co.



New type of gasoline locomotive which embodies a new kind of drive principle



View showing method of placing power plant of gas locomotive on spring-suspended sub-frame

Gas-Electric Drive for Trucks

THE General Electric Co., Schenectady, N. Y., has recently published a report on the application of gas-electric drive as applied to trucks. This was based on an analysis of operation of 19 gas-electric trucks owned by the Philadelphia Rural Transit Co. and it is claimed that on a total of 27,491 miles of operation over a three-month period, there were no road failures nor engine trouble.

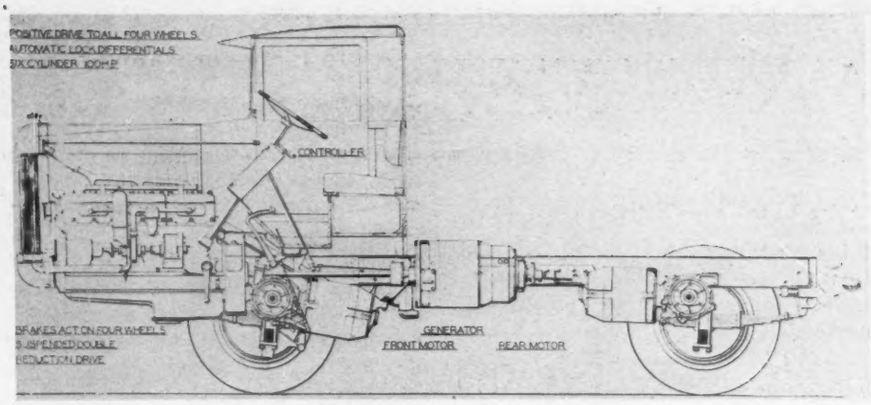
The trucks in question were manufactured by the Walter Motor Truck Co. of Long Island and the electric equipment was supplied by the General Electric Co. The trucks were put into operation last winter as snow plows, but with the coming of summer the snow plow attachments were removed and the vehicles operated as trucks.

With a chassis weight of 12,000 lb. and a trailer and load weight of from 16,000 to 20,000 lb.—totaling from 28,000 to 32,000 lb. —it was found, according to the company, that the trucks could maintain a free running speed of over 25 m.p.h. on open roads with the motors in parallel or, in the series position, operate through soft dump grounds with practically no temperature rise. All the trucks are equipped with Pendal trailer couplers.

The following is taken from the company's report:

"A typical day's operation of one of the P. R. T. gasoline-electric trucks on general utility duty included the following cycle, repeated several times with no time lost waiting for loads; spotting four Warner trailers at an excavating job; moving four loaded trailers to dump ground about a mile away with a total load (including the weight of the truck and trailer) of over 15 tons; moving into a dump ground of soft, yielding earth; dumping the load and coming out again without difficulty. Three- and five-tons gear-shift trucks, with comparatively lighter loads, invariably had to be hauled out of the same dumping bank.

"In such service the operator of the gas-electric truck would merely put his controller in the series position and open the throttle wide. This would take him out of difficult positions with a smooth, even flow of torque to the driving wheels."



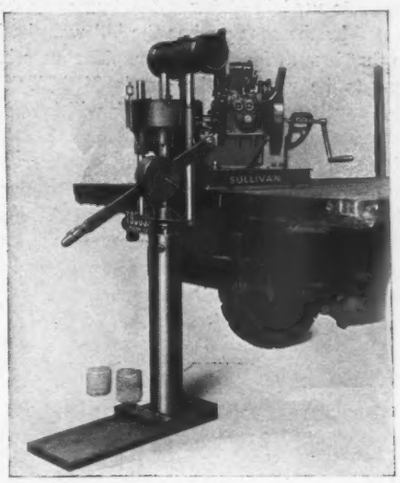
New type of truck, designed to be used with trailer, having gas-electric drive

The driving mechanism of these trucks consists of a d.c. generator driven by a gas engine and supplying power for operating two motors each driving a Walters lock-differential axle, thus providing four-wheel drive.

New Core Drill for Testing Concrete

A NEW, compact and rapid drill for removing cores of concrete pavements to permit inspection of the structure and material has been brought out by the Sullivan Machinery Co. of Chicago. This new drill is operated by a gasoline engine, weighs 772 lb., and is intended to be mounted on the rear end of a motor truck. It drills a 6⅝-in. hole, and it is claimed that it will remove a 6-in. core at the rate of 1 ft. in 15 to 20 minutes. With the core barrel generally furnished the machine will drill to a depth of 18 in.

This core drill consists of a drive rod rotated through bronze worm gears by a direct-connected Buda 6-hp., 2-cylinder gasoline engine. The drive rod is kept in alignment by side rods connected to a crosshead at the bottom of the drive rod, and running through cylindrical sleeves which are cast in one piece with the heavy bedplate or frame supporting the drill and engine. At the lower end of the drive rod is a spider to which the core barrel, 6 in. in diameter, is bolted. The drill is fed downward automatically by means of a double rack cut on the side rods, and double pinions, the speed being controlled by a hand lever. The cross-



Core drill in place on truck ready for testing pavement

head is equipped with a ball bearing which takes both the radial and thrust loads and provides a rigid support for the barrel. Drilling is accomplished by shot under the face of the barrel which crushes the surface of the concrete.

New type of gas-electric truck and trailer

Takes Over Tractor Plant

A RECENT announcement from the Allis-Chalmers Co., Milwaukee, Wis., states that the Monarch Tractor Corp. of Springfield, Ill., has been purchased by Allis-Chalmers. The business will be continued under the same name as a subsidiary of the larger company, after March 1, which was the date of transfer of ownership. The Monarch company will continue to manufacture 6-ton and 10-ton tractors at its Springfield plant. R. W. Gotshall is president of the company, H. B. Baker is sales manager, and E. F. Norelius is chief engineer. It is stated that additional machinery is being added to increase the plant production.

Portland Cement Imports

AN attractive reprint of an article, "American Cement Industry Facing Serious Crisis," by Charles H. Boynton, from the *Industrial Digest,* is being circulated. Mr. Boynton is assistant to the president of the Atlas Portland Cement Co., New York City, and his article describes in detail how low living standards and low labor costs in some European countries are robbing domestic portland cement manufacturers of important markets.

Iowa Senate Defeats Move to Obtain Cement by Condemnation

ATTEMPTS of members of the lower house of the Iowa general assembly to include authority for condemnation proceedings against cement and other manufactured products used in highway building were defeated by the senate when the bill went back to that branch for final action. The material was to be used in the state's $100,000,000 highway bond issue work which will be submitted for approval to the voters at the November election. The bill, however, as finally adopted, included authority to purchase cement manufacturing plants. A separate bill, introduced by members who sponsored the condemnation plans providing for purchase of cement manufacturing plants by the state, was also adopted.

Kokomo Stone Co. Sold to Erie Stone Co.

SALE of all the shares of stock of the Kokomo Stone Co. of Kokomo, Ind., and delivery of all its property to the Erie Stone Co. of Toledo, Ohio, has been announced by Charles N. Hodgin, manager of the Kokomo company. It is the intention of the Erie company, which is an Indiana corporation already operating two plants in that state, to continue operation of the property. The site includes 24 acres of ground composing the quarry site.

Ohio River Association Formed by Gravel Producers

THE Ohio Valley Sand and Gravel Producers Association was formed at Huntington, W. Va., March 26, at a conference of 30 producers representing territory along the Ohio river and tributaries between Pittsburgh and Cincinnati.

C. C. Patterson, Pittsburgh, was elected president; F. E. Hall, Cincinnati, vice president; and J. L. Richmond, Huntington, W. Va., secretary-treasurer. In addition to Messrs. Patterson and Hall, G. B. Debout, of Zanesville, were named directors.

Gravel Company Buys Access to Plant for Railway

A RESOLUTION granting the firm of Sturm and Dillard the right to construct and maintain a grade crossing on the Island road north of Circleville, Ohio, has been passed by a majority vote of the board of county commissioners.

The crossing is to be used for a switch to connect the Chesapeake and Ohio railroad and the Norfolk and Western railways to the the stone crushing and gravel plant of the company.

The Sturm and Dillard Co. is to construct at the crossing automatic alarm bells and flasher or blinker lights to warn travelers on the public highway when any trains approach the crossing.

No train is to obstruct the crossing for a period longer than five minutes and trains shall not be operated over the crossing at a higher rate of speed than ten miles an hour.

The firm of Sturm and Dillard is to pay a rental of $350 a year, for a period of ten years.—*Circleville* (Ohio) *Herald.*

New Gravel Development at Lake View, Iowa, Planned

THE Legrand Crushed Rock and Gravel Co. is planning extensive improvements in the development of the 100-acre tract leased from the Chicago and Northwestern railroad at Lake View, Iowa. This company is affiliated with the Howard Construction Co. of Chicago. Plans are under way to erect a modern plant for handling washed and screened gravel which will be electrically equipped throughout, and negotiations are under way to secure electric power from the Lake View power plant. The Northwestern Gravel Co., which is already operating at Lake View, recently moved its offices from Des Moines to its large plant at that city.

Sand Company Is Sued for Dredging by City of Wichita

THE city of Wichita, Kan., filed suit in the district court recently to stop the Consumers Sand Co. from pumping sand from the Big Arkansas river below the Harry street bridge and to collect $1000 from the company for damages already done to city property along the west bank of the stream.

According to the city's petition, the pumping plant is located on the east bank directly opposite the strip owned by the city. However, it is alleged, the company's operations in removing sand from the river bed is causing the west bank to crumble away and the city's property is rapidly deteriorating.—*Wichita* (Kan.) *Eagle.*

Texas Still Proposes a State Cement Plant

IN compliance with the resolution adopted by the Texas legislature at its last regular session, the State Board of Control has taken steps to construct and operate a state-owned cement manufacturing plant. Preliminary to definite action in the matter, an investigation of all phases of the cement industry in Texas is being made by the State Agricultural and Mechanical College, according to R. B. Walthall, chairman of the Board of Control. Mr. Walthall has taken up the matter with the engineers of the State Highway Commission with the view of learning the requirements of that body in the matter of using cement for the construction of highways. The question is also being considered of making the proposed cement plant one of the industries of the state prison system. R. H. Baker, chairman of the State Prison Commission, has expressed himself in sympathy with the idea that the manufacture of cement should be carried on by convicts, if such a plant can be operated without a loss and make a reasonable profit.

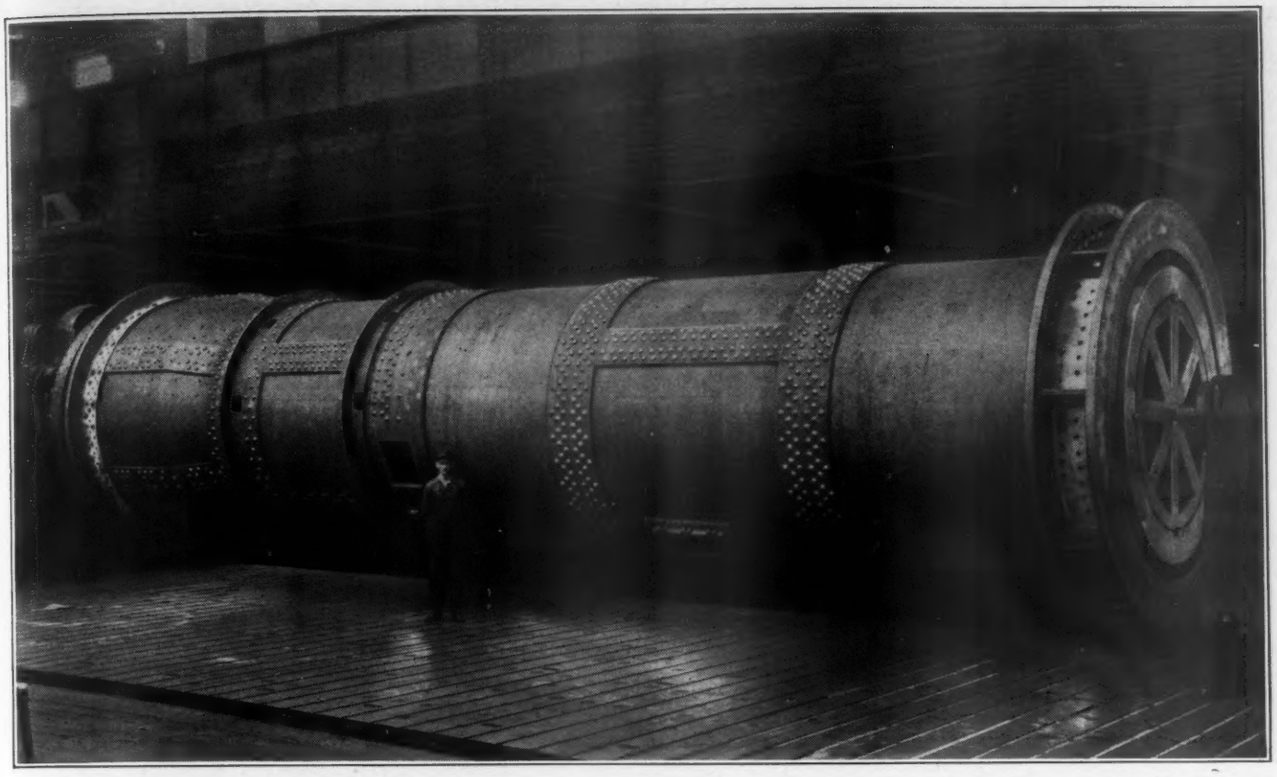
Buffalo Men Organize New Gravel Company

ANNOUNCEMENT was made in Buffalo, N. Y., recently of the organization of the Diamond Gravel & Navigation Co. with offices at 519 Brisbane building. The company will operate four sand boats out of Buffalo and at other ports along Lake Erie.

Capt. James W. Baker of Buffalo, who has been elected president, announced that the following officers have been elected: Vice-president, M. M. Wall; secretary-treasurer, Fred Holtz; directors, Clyde Lanctot and E. E. Becker. The company plans to begin operations of navigation.—*Buffalo* (N. Y.) *Express.*

Machinery Manufacturers Are Merged

THE Vergan-Schmidt Co., Champaign, Ill., which has manufactured the "Tractocrane," a crane mounted on tractor carriage, extensively used by cement mills, sand and gravel handlers, and similar concerns, has been merged with the Dubuque Tractor and Truck Co. of Dubuque, Iowa. A new company, the Vergan-Schmidt Manufacturing Co., has been organized with its factory in Dubuque, in the former Dubuque Tractor plant at Washington and 26th streets. The Champaign concern also built automatic equipment for handling lumber in dry kilns and elevator equipment for yard use. A force of 60 will be employed by the new company. Charles Vergan has been president of the Champaign firm and Paul Klum of the Dubuque Tractor company.



Machining Flanges of World's Largest Compeb Mill

Manufacturing Facilities Reflect in the Quality of All Products

Allis-Chalmers' Designing Engineers appreciated in the early days of cylindrical grinding mills, the vital importance of correct alignment of the heads and for over 25 years it has been standard shop practice for all Allis-Chalmers Tube, Ballpeb and Compeb Mills to machine the face of the flanges in a lathe. This operation takes place after the flanges have been riveted to the shell, thereby insuring correct alignment of the heads and accounts to no small extent for the reputation of low operating costs of Allis-Chalmers' Mills.

There is a vast difference between the shop facilities required to machine the flanges on a Tube Mill of 25 years ago and the Compeb Mill of today, but Allis-Chalmers' manufacturing facilities have ever kept pace with correct machinery design.

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

When writing advertisers, please mention ROCK PRODUCTS

News of All the Industry

Incorporations

Taft Sand and Gravel Corp., Northville, Mich., $10,000.

Detroit Marbelite Products Co., Detroit, Mich., $25,000.

New River Lime Co., Ripplehead, Va., $25,000. Bernard Mason, Clay Mason.

Rock Products Corp., Fort Worth, Tex., capital increased $15,000 to $20,000.

Lewis County Gravel Co., Centralia, Wash., capital increased $30,000 to $50,000.

St. Charles Lime and Quarry Co., St. Charles, Mo., $25,000 Charles Hahn and others.

Dinero Sand and Gravel Co., Brownsville, Tex. John Gregg, H. G. Gray and Clarence Owens.

Iowa Lime Rock Corp., Oskaloosa, Ia., $50,000. H. W. Harding, president and general manager.

Standard Sand and Gravel Co., Fort Smith, Ark., $9000. J. W. Hood, W. B. Pattison, W. E. Harrell.

Hartong Gravel Co., 1140 E. 87th St., Chicago, Ill., $2000. Geo. H. Hartong, Adelaide N. Hartong, E. A. Keappler.

Empire Granite Co., Elberton, Ga., $15,000. Clark Edwards, Jr., attorney. O. Minervini, Felix Solana, H. H. Stoner.

Feldspar Milling Co., Burnsville, N. C., $500,000. I. F. Shinn, J. L. Hyatt, C. B. Hyatt, 69 Edwin Place, Asheville, N. C.

Blue Rapids Gravel Co., Holton, Kan., $50,000. Ed Grundeman, Otto Grundeman, W. R. Canfield, Frank Kaul, F. L. Rieder.

Port Angelus Shore Brick and Tile Co., $25,000. Russell W. Fros, H. M. Grimes, H. Mangano, C. H. Harvey, Ernest C. Preese.

Gulf Coast Shell and Cement Co., Palacios, Tex., capital increased $10,000 to $150,000. Carlton Crawford, secretary, Kress Bldg., Houston, Tex.

P. Grassi & Co., San Francisco, Calif., $500,000. Travertine quarry and plant. W. R. Lowery. Carlo Tricoli, S. Andriano, Penzo Turco, P. Buddington.

California Concrete Products Co., Santa Clara, Calif., $25,000. J. Fred Holthouse, John Abreo, John T. Demichell, Henry Scholten, H. S. Maryanski.

White Plains Asphalt Co., White Plains, Ky., $50,000. E. E. George, Procterville, Ohio; G. V. George, Detroit, and B. B. Hall and H. H. Sheets, Huntington, W. Va.

Koating Co., 219 W. Chicago Ave., Chicago, Ill., 400 shares, no par, manufacture and deal in building materials. W. D. Brown, A. A. Burman, Samuel J. Andelman.

Merritt Concrete Products Co., Santa Clara, Calif., $300,000. R. Convery, Roy A. Bronson, V. Berges, S. L. Cooper, C. F. Tramutolo, all of San Francisco, Calif.

Chicago Architectural Stone Co., 1906 S. Western Ave., Chicago, Ill., $40,000. Walter S. Bell, Harry Platt, N. H. Taylor. Correspondent: Ungaro, Blumenthal and Romano, 134 S. La Salle St., Chicago.

American Limerock Corp., Savannah, Ga., $50,000. Frederick A. Von Eberstein, Barton A. Horswell, P. A. Horswell, M. O. Dunning and F. M. Oliver, all of Chatham county, Georgia. Quarry is to be near Cordele, Crisp county.

Illinois Building Material Corp., 11 South La Salle St., Chicago, Ill., 20,000 shares, no par value. Manufacture and deal in sand, gravel, etc. H. Abarbanel, L. L. Cowan, J. H. Brown, correspondent L. L. Cowan, 11 S. La Salle St., Chicago, Ill.

Builders Supply and Equipment Co., Clarksburg, W. Va., 10,000 shares no par value, 2500 shares $100 par. To manufacture cement, plaster, fertilizer, etc. Frank D. McEnteer, Boyd S. Fleming, Theodore N. Hornor, Edward J. Costello, Louis A. Johnson.

Gypsum

United States Gypsum Co., Chicago, has oppointed Robert Colvin of Fort Dodge, Iowa, as manager of the Grand Rapids, Mich., office.

Gypsum Products Corp., Seattle, Wash., is making alterations and improvements to its factory at 6851 East Marginal Way, Seattle.

Standard Gypsum Co., Long Beach, Calif.; Martin Uldall, president, is making a tour of the coast and states that the outlook is most encouraging for a good building year all along the coast. His company has plaster manufacturing plants in Seattle, Ludwig, Nev., and Long Beach, Calif. In addition to their "Standard" plaster they manufacture "Calacoustic," a sound absorbing plaster, which has been used with success on a number of outstanding coast buildings.

Quarries

Los Angeles Harbor Department, Los Angeles, Calif., has opened its own quarry on Catalina Island to supply 60,000 tons of rock for local port work at San Pedro.

A. C. O'Laughlin Co., Chicago, Ill., has moved its executive offices from the Chamber of Commerce building to the fifth floor of the Builders building, 228 North La Salle St.

Hauser Construction Co., Portland, Ore., has a contract for 500,000 tons of rock for United States jetty work at Charleston, Ore. The rock is to be furnished from the company's quarries near Marshfield, Ore.

Dolomite, Inc., Maple Grove, Ohio, recently set off the first blast, which will open a new level in its quarry, which now covers 115 acres, with a present quarry face of about 40 ft. The new level will carry the quarry operation about 25 ft. deeper. This operation was fully described in ROCK PRODUCTS, February 4, 1928.

Interstate Rock and Crusher Co., Kansas City, Kan.; an involuntary petition in bankruptcy was filed in the federal court, Kansas City, March 12. The petition was brought by these creditors: Security State Bank, Ottawa, Kan.; Great Western Manufacturing Co., and Mann, Barnum & Welch, insurance agents. Their claims aggregate $3,431.56. In addition to these claims the Waldo State bank holds a preferred claim for $18,500, secured by an attachment.

The National Lime and Stone Co., successor to the National Quarries Co., Lima, Ohio, has won a long-drawn-out legal battle with the Detroit, Toledo and Ironton R. R. and will proceed with the development of its quarry property on both sides of the railway right-of-way, through the use of a tunnel under the railway tracks. The title to the land pierced by the tunnel is vested in the railroad and any title of the stone company in land or right-of-way, which it claimed, other than its right to use the tunnel, is relinquished, the agreement is understood to provide.

Jackson County, Independence, Mo., has authorized the purchase of 15 acres of land from W. I. Thomason in the vicinity of Grain Valley in order to acquire a rock quarry in that part of the county. The land bought is described as the south 15 acres of the east half of the southeast quarter of the northeast quarter of Section 2, Township 48, Range 31. This gives the county its second quarry in the eastern part, the other being the tract on the Independence-Lee's Summit road bought several years ago by the preceding court from Frank Milton. The price paid for the Thomason tract was $200 per acre.

Sand and Gravel

Typo Sand and Gravel Co., Typo, Ky., was formally dissolved on February 23, 1928.

Sypolt Gravel and Construction Co., Marion, Ind., is expanding its contracting business.

Oborny Bros., La Crosse, Kan., are installing equipment in a gravel pit near Timken, Kan.

John R. Cox, Rutland, Ill., has opened a new gravel pit on the Henry Weers farms, north of Lacon, Ill.

Estill Springs Sand and Gravel Co., Nashville, Tenn., is reported to be operating day and night to meet orders.

R. D. Smith, Columbus, Ga., has leased a gravel pit on Bull Creek, near Columbus, and will develop the property at once.

Blue Rapids Gravel Co., Blue Rapids, Kan., has leases on property of 40 acres with an estimated depth of gravel of 80 ft. A pumping operation is being installed.

Porter Construction Co., Lobert, Ore., has practically doubled the capacity of its sand and gravel plant on the Williamson river. The work being done includes the installation of a new washing device and additional crushing rolls and shaker screens.

Northeast Missouri Sand and Gravel Co., New London, Mo., has resumed operations after a winter shutdown, during which many improvements and plant extensions were made.

Van-Sciver Corp., Philadelphia, Penn., has added another yard to its sand and gravel distributing chain; it has taken over the George A. Sinn, Inc., plant at Bridge St. and Delaware River in Frankford, Penn.

Nickum and Kelly, Portland, Ore., producers of sand and gravel, have appointed Kenneth Poorman as manager. Mr. Poorman has operated a fleet of trucks for 16 years, delivering the material of the sand company.

Lanesboro Sand and Gravel Co., Lanesboro, Penn., will expend $40,000 on new buildings and other improvements this spring. The Lanesboro council has granted the company the right to erect new buildings on the opposite side of the road from where the present plant is located. Work will be started as soon as possible. The company expects to work the sand and gravel beds to full capacity, and will more than double the output of last year. Several more men will be employed this season.

Cement

Superior Portland Cement Co., Jackson, Ohio, has completed improvement work, including enlargement of rotary kilns, which has doubled the capacity of the plant.

Southwestern Portland Cement Co., El Paso, Tex., will entertain the national convention of the American Association of Engineers on June 5 with a barbecue, as part of an inspection trip through the plant.

Pennsylvania-Dixie Cement Corp. has leased large space in the new Lefcourt-National building, northwest corner of 5th Ave. and 43rd St., New York City. The cement company will move its executive offices from 131 East 46th St. on completion of the Lefcourt-National building, about a year hence.

Carolina Cement Co.—A party of business men arrived in New Bern, N. C., recently from Raleigh, on business connected here with the new cement plant of the Carolina Cement Co. In the party were J. A. Acker, president of the company, now residing in Raleigh; F. R. Patterson, D. P. Donahue, A. D. Cheesman and A. Radtke, who was accompanied by Mrs. Radtke.

Beaver Portland Cement Co., Gold Hill, Ore.—A tunnel is being driven in the shale pit. A night shift is also employed at the rock quarry at present. Grades are being laid out and staked for a trucking road to a new lime quarry which belongs to the company and located on the opposite side of the hill from the shale pit. In this quarry is about 90,000 tons of rock which the company expects to remove as soon as possible after the necessary facilities are to be had. It will necessitate the building of a roadway over which the rock can be hauled by truck to the company's bins. The grade will be rather steep, it being about an 8% grade over its entire route. Shipments of cement are going forth in enlarged quantities. Besides the regular shipments of sacked cement there are several cars a day of bulk cement being sent to Portland, where it will be used in the building of a sea wall.

Slag

Ohio Material Co., Cleveland, Ohio, John Truby, president and general manager, has purchased the American Slag and Supply Co., East 196th St., Cleveland. A batching plant for concrete mixtures is being built and a certified concrete equipment is also being added. A crane costing $20,000 will be erected and six large silos holding 600 tons of building material each will be built. The Ohio Material Co. has conducted a building supply business for six years. The company has a dock at Mahoney and West 3rd street, where three ships deliver stone from Michigan and sand from Pelee Island. The company also has had a sand bank at White House crossing, Garfield Heights, for a number of years. The company is establishing a large building material office and yard at this point also. It will be similar in magnitude to the Euclid plant.

ARNOLD & WEIGEL
CONTRACTORS AND ENGINEERS

Centralized Control means the centering of manifold responsibilities on ***one*** organization. It means the designing and building of a modern lime plant in which all features are characterized by uniform excellence. It means—Arnold & Weigel Lime Plant Building Service.

WOODVILLE, OHIO, U.S.A.

CARBEX GRINDING BALLS

Made of special analysis forged steel. Guaranteed service.

Attractive prices on standard sizes—2½ in., 3 in., 4 in., 5 in. Shipment from stock.

Largest Exclusive Manufacturers of Grinding Media

COATES STEEL PRODUCTS COMPANY

Greenville, Ill. U. S. A.

Cement Products

Harold Davodor and Frank Sartore, Hopewell, Va., are planning the establishment of a concrete products plant with a daily capacity of 3000 blocks.

Shearman Concrete Pipe Co., of Knoxville, Tenn., has been awarded a contract for all sewer pipe to be used by the city of Atlanta during the year. About 25 miles of pipe is involved.

St. Louis, Mo. The recent order by Building Commissioner Christopher to permit the use of cinder blocks in buildings of two and one-half stories has been opposed by the board of aldermen of the city and a resolution passed against it.

Hamilton Dun-Tile Co., Hamilton, Ohio, has been organized recently and property for a factory has already been leased. Al. Roth is president of the company, Dr. C. J. Baldridge is vice-president, A. D. Stuckey is treasurer, and C. P. Tubbs is secretary. Paul Heak has been namde superintendent for the new plant. The company was incorporated for $11,000.

Lime

Stearns Lime and Stone Co. announces the removal of offices to 105 West Adams St., Chicago, Ill.

Luckey Lime and Supply Co., Luckey, Ohio; the directors gave a dance and entertainment recently for their employes in a new large building at the plant, dedicated to their use. The children were happily entertained at games on the lower floor while their elders danced upstairs, and refreshments were served to the large company present.

Slate

Frank Bixler, Rockaway, N. Y., has purchased a 50-acre tract from the Buckley farm in Mansfield township and will open a slate quarry.

Noel Kane and **Leigh Lundy**, of Kane & Lundy, Inc., representing the Vermont Structural Slate Co. of Fair Haven, Vt., in New York City and the Metropolitan District, announce the opening of their offices at 103 Park Ave., New York City.

Agricultural Limestone

Illinois Farm Bureau members hope to establish a new record for the use of limestone in 1928. Last year late figures show that more than 650,000 tons of limestone were spread on Illinois soil. While this was greater than the year before, it fails to equal the record tonnage of 700,000 tons used in 1925. With favorable weather, farm advisors who are close to the situation see no reason why previous records cannot be shattered. Judging by movement of the material at the present time the demand is excellent. Illinois farmers in general are in a more prosperous condition than for several years past. Prices are about the same as last year.

J. I. McCants

Personals

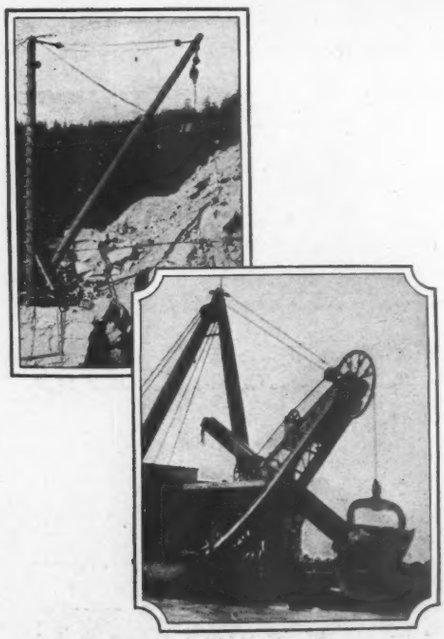
C. E. Fontaine has been appointed sales manager of the Virginia Portland Cement Corp., National Bank of Commerce Bldg., Norfolk, Va.

L. A. Behrle, formerly assistant general freight agent of the Chicago and Alton R. R., is now general traffic manager of the Chicago Gravel Co., Chicago, Ill.

H. P. Sigwalt, who for the past five years has been advertising manager of the Milwaukee Corrugating Co., is entering the advertising agency field on April 1 with the Cramer-Krasselt Co., Milwaukee, one of the largest agencies in the country, where he will take charge of the industrial advertising division. As former secretary and at present third vice-president of the National Industrial Advertisers Association, vice-president of the Milwaukee Advertising Club, and formerly president of the Milwaukee Association of Industrial Advertisers, Mr. Sigwalt is widely known in the advertising profession. D. C. Smith has been appointed to succeed Mr. Sigwalt as advertising manager of the Milwaukee Corrugating Co.

J. I. McCants, for many years identified with the cement industry in the South, has recently become affiliated with the sales organization of the Bates Valve Bag Corp. and will represent the company in the South as southern sales manager. Mr. McCants needs no introduction to those engaged in the cement manufacturing business or to the dealers and consumers of cement, having been engaged in the sales end of this business in the South since 1905. For 12 years he was connected with the old Standard Portland Cement Co. at Birmingham as general sales manager. This company was later sold to the Atlas Portland Cement Co. Mr. McCants resigned this position to engage in the retailing of building materials, subsequently selling his interest in the Standard Fuel and Material Co. of Birmingham, one of the largest concerns in the South, to re-enter the cement business as general sales manager of the Signal Mountain Portland Cement Co. at Chattanooga, Tenn. The Bates Valve Bag Corp. has recently established a factory at Birmingham, Ala., to supply the needs of their Southern customers. The strategic location at Birmingham will enable the Bates corporation to make quick deliveries and the organization is prepared to co-operate to the fullest extent with the cement manufacturers and users of cement and other commodities that are being shipped in the Bates multiwall paper bags.

ROEBLING WIRE ROPE



In quarry work exceptional conditions exist which must be met by the use of wire rope possessing exceptional qualities. Our

"BLUE CENTER" STEEL WIRE ROPE

possesses these qualities and is the ultimate choice of discriminating engineers for every purpose for which wire rope is used.

Catalog A-545

John A. Roebling's Sons Company Trenton, N. J.

The Coming Improvement for Wet Process Plants —Slurry Filtration

Just a typical example of the work United Filters engineers are doing—

In the sugar industry, where efficient filtration is so vital, United Filters engineers have recommended and installed different types of filters totaling more than 700,000 square feet of filter area.

Other major industries where they have installed many of their ***six different types of filters are***—mines, paper, oil and general chemical.

United Filters is "filtration headquarters."

IT has been definitely shown that at least three distinct ways of reducing operating costs result when cement slurry is filtered before being sent to the kilns:

coal costs are reduced

mud rings are eliminated

production ***per existing kilns*** can be increased

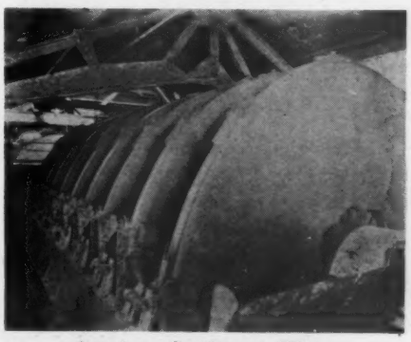
In addition, finer grinding is made practical, thus improving the quality of the cement.

These benefits have been disclosed in actual plants where the entire feed to one or more kilns is first filtered on the American Continuous Filter.

Unquestionably, filtration of slurry is the coming improvement for wet process plants.

On the technique of filtration and for the proper equipment, it is but natural then to turn to engineers who have had broad and varied experience in filtration problems . . . and who have already installed the pioneering filters in the cement industry.

The engineers just referred to are the United Filters engineers. They will be glad to discuss the advantages of slurry filtration with any cement manufacturer.



American Continuous Filter in a Prominent Cement Plant

UNITED FILTERS CORPORATION

Main Office and Laboratory—Hazleton, Pa.

New York Chicago Salt Lake City Los Angeles

Export Office—25 Broadway, New York

Code Address—Unifilter, New York

DIGGING—STRIPPING—STORING

DRIVE THEIR COSTS LOWER and LOWER

WITH THIS ONE-MAN MACHINE

Goodbye Expensive Digging and Stripping Equipment

Novo Drag Line Hoists are the logical answer to low digging and stripping costs. They excavate sand and gravel, strip overburden, grade railroad beds, clean and excavate cellars, store and reclaim any bulk material. Wherever material must be handled up to 400 feet—Novo Drag Lines are the economical way to do it.

They are dependable, too, even on the toughest jobs. If the material is to be taken from the bottom of a river—they go down after it. If it's hard packed—they pry their way into it. And they dig equally well going up hill or down.

The Novo Hoisting Handbook contains the kind of "on-the-job" information you can use —it's complete—and it's free.

Novo Drag Line outfits are extremely flexible. They can store and reclaim material over areas of virtually any size or shape.

They work cheaper than steam shovels, cableway excavators, or horses and drag scrapers. And they work where other methods can't reach.

If you are interested in larger profits or feel that your handling costs are too high—investigate this one-man outfit that has proven so profitable to other users. Send for a copy of the "Hoisting Handbook" describing Novo Drag Line Hoists, today.

NOVO ENGINE COMPANY, 250 Porter St., Lansing, Mich.
C. E. BEMENT, Vice-Pres. and Gen. Mgr.

NOVO

PUMPS—ENGINES—HOISTS

Service, parts and sales in 65 cities

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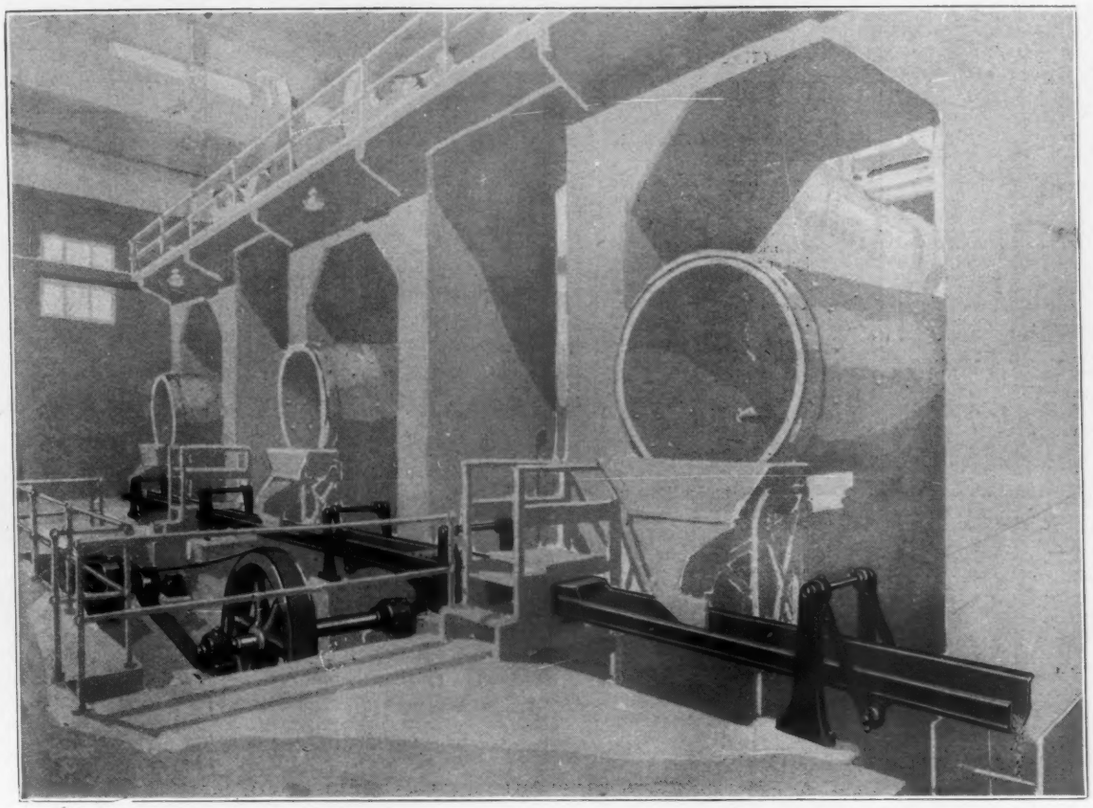

A Skipulter installed in a western cement plant, where it is conveying cement clinker, discharged from three coolers, to an elevator

THE Skipulter is an improved type of shaker conveyor for transporting coarse materials, such as cement clinker, coal, ore, slag, rock, limestone, etc.

It consists of a steel trough, suspended by pendulums, actuated through a flywheel and eccentric into an intermittent forward and backward motion. No springs or rollers are employed. The transported material is rapidly and constantly carried forward to point of discharge.

This type of conveyor is one of the simplest means of conveying materials, economical to operate, requiring very little horsepower, and is a simple solution to many conveying problems.

F. L. Smidth & Co., Inc.

ENGINEERS

50 Church Street — **Designers and Equippers of Cement Making Factories** — **NEW YORK**

Factory, Foundry and Laboratory—Elizabeth, N. J.

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For alphabetical index, see page 128

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Hardinge Co.
Polysius Corp.
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Bags
Valve Bag Co. of America

Bagging Machinery
Valve Bag Co. of America

Ball Bearings
New Departure Mfg. Co.

Balls (Tube Mill, etc.)
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Coates Steel Products Co.
Electro Metallurgical Sales Corp.
Polysius Corp.
W. A. Riddell Co.
F. L. Smidth & Co.

Bearings
Electro Metallurgical Sales Corp.
Koppel Industrial Car & Equipment Co.
New Departure Mfg. Co.
Timken Roller Bearing Co.
T. B. Wood's Sons Co.
Webster Mfg. Co.

Bearings (Anti-Friction)
New Departure Mfg. Co.
Timken Roller Bearing Co.

Bearings (Collar Oiling)
New Departure Mfg. Co.
T. B. Wood's Sons Co.

Bearings (Radial)
New Departure Mfg. Co.

Bearings (Tapered Roller)
Timken Roller Bearing Co.

Bearings (Thrust)
New Departure Mfg. Co.
Timken Roller Bearing Co.

Belt Fasteners and Hooks, Lacings and Rivets
Crescent Belt Fastener Co.

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New York Rubber Co.
Quaker City Rubber Co.

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Good Roads Mchy. Co., Inc.
Traylor Eng. & Mfg. Co.
Webster Mfg. Co.

Bin Gates
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R. H. Beaumont Co.
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Link-Belt Co.
Smith Engineering Works.
Stephens-Adamson Mfg. Co.
W. Toepfer & Sons Co.
Traylor Eng. & Mfg. Co.

Blasting Machines
Hercules Powder Co.

Blasting Supplies
Hercules Powder Co.

Block Machines (Concrete)
W. A. Riddell Co.

Blocks (Pillow & Roller Bearing)
Timken Roller Bearing Co.
T. B. Wood's Sons Co.

Blocks (Sheave)
R. H. Beaumont Co.
Sauerman Bros.

Blowers
De Laval Steam Turbine Co.
Northern Blower Co.

Blowpipes
Haynes Stellite Co.

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Easton Car & Construction Co.

Brick Hardening Cylinders
Komnick Machy. Co.

Brick Loading Apparatus
Komnick Machy. Co.

Brick Machinery (Sand Lime and Slag)
Deister Concentrator Co.
Jackson & Church Co.
Komnick Machy. Co.
W. A. Riddell Co.
Dr. Bernhardi Sohn

Bucket Conveyors (See Conveyors and Elevators)

Buckets (Dragline)
R. H. Beaumont Co.
Sauerman Bros.
G. H. Williams Co.

Buckets (Elevator and Conveyor)
American Manganese Steel Co.
Cross Engineering Co.
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Link-Belt Co.
Polysius Corp.
Smith Engineering Works.
Stephens-Adamson Mfg. Co.
W. Toepfer & Sons Co.
Webster Mfg. Co.

Buckets (Grab, Clamshell, etc.)
American Manganese Steel Co.
Industrial Brownhoist Corp.
Link-Belt Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
G. H. Williams Co.

Buhr Mills
J. B. Ehrsam & Sons Mfg. Co.

Buildings
H. K. Ferguson Co.

Cables (Electrical)
John A. Roebling's Sons Co.

Cableways
R. H. Beaumont Co.
S. Flory Mfg. Co.
Link-Belt Co.
Mundy Sales Corp.
Sauerman Bros.
G. H. Williams Co.

Calcining Kettles (Gypsum)
J. B. Ehrsam & Sons Mfg. Co.

Caps (Blasting, Electric, and Delay Electric)
Hercules Powder Co.

Car Pullers
Mundy Sales Corp.
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.

Cars (Dump)
Austin Mfg. Co.
Easton Car & Construction Co.
Link-Belt Co.
Koppel Industrial Car & Equipment Co.
Kentucky Wagon Mfg. Co.

Cars (Quarry and Gravel Pit)
Easton Car & Construction Co.
Koppel Industrial Car & Equipment Co.

Carriers
Barber-Greene Co.
Stephens-Adamson Mfg. Co.

Castings
Alloy Steel & Metals Co.
Eagle Iron Works
Electro Metallurgical Sales Corp.
Link-Belt Co.
Timken Roller Bearing Co.
Vulcan Iron Works

Cement Pumps (See Pumps, Air Pumps)

Chain (Dredge and Steam Shovel)
Bucyrus-Erie Co.
Jeffrey Mfg. Co.

Chain (Elevating and Conveying)
American Manganese Steel Co.
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.

Chain Drives
W. A. Jones Fdy. & Machine Co.
Link-Belt Co.

Chain Links (Cold Sheet, Repair, etc.)
Bucyrus-Erie Co.

Chemists
Arnold & Weigel.
Rob't W. Hunt Co.

Chutes and Chute Liners
Cross Engineering Co.
F. L. Smidth & Co.
Webster Mfg. Co.

Clamshell Buckets—See Buckets (Grab, Clamshell, etc.)

Clamshell Cranes (See Cranes)

Classifiers
Traylor Vibrator Co.

Clay Working Machinery
Bonnot Co.

Clutches
W. A. Jones Fdy. & Machine Co.
T. B. Wood's Sons Co.

Coal Pulverizing Equipment
Allis-Chalmers Mfg. Co.
Bonnot Co.
Hardinge Co.
Pennsylvania Crusher Co.
Polysius Corp.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Vulcan Iron Works.
Williams Patent Crusher & Pulverizer Co.

Compressed Air Hoists
Chicago Pneumatic Tool Co.
Gardner-Denver Co.

Compressed Air Rock Drills
Chicago Pneumatic Tool Co.
Gardner-Denver Co.

Compressors
Pennsylvania Pump & Comp. Co.

Concentrators (Magnetic)
Dings Magnetic Separator Co.

Concentrators (Slurry, etc.)
Deister Concentrator Co.
Traylor Vibrator Co.

Concrete Mixers
Niagara Concrete Mixer Co.

Contactors (Belt)
T. B. Wood's Sons Co.

Contractors and Builders
Burrell Eng. & Const. Co.
H. K. Ferguson Co.

Conveyor Belting (See Belting)

Conveyors and Elevators
Austin Mfg. Co.

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF FLORIDA

Bankruptcy Sale!

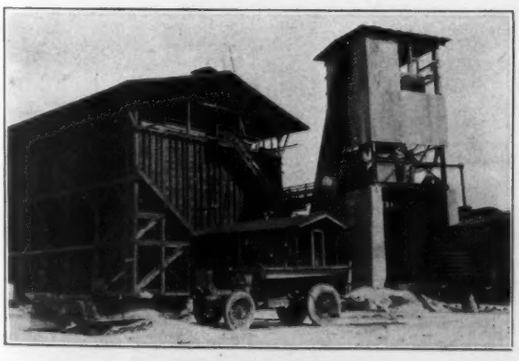
General view of the plant of Florida Rock Products Co., Brooksville, Fla. The Amiesite plant is at the left and is connected by conveyor with crushing plant at right

Florida Rock Products Co.

Crushed Stone and Amiesite Plant

To be Sold as a Complete Unit

Petition filed in bankruptcy has necessitated offering for sale by the trustee, on the 20th of April at 10:00 o'clock in the forenoon at the office of Hon. H. P. Baya, Referee in Bankruptcy, Tampa, Fla., the property and plant of the Florida Rock Products Co., Bankrupt, located in Hernando County, one mile out of Brooksville, Florida. This plant is located in the region where Tampa limestone occurs—the only limestone formation in the state suitable for producing a commercial crushed stone similar to that produced generally throughout the United States. The plant is modern and complete in all details, and is favorably located as regards labor and transportation facilities.



End of Amiesite plant showing elevator loading material for shipment

The property, plant and all assets with complete quarry equipment, is offered for sale subject to confirmation by Referee. For crushed stone producers interested in expanding their activities, this is a rare opportunity to acquire a plant at a real bargain as appraisement of assets is only 15 per cent of the assets as listed in the bankruptcy schedule. Inquiries are respectfully solicited.

General view of the crushing plant

Address inquiries to

L. L. BUCHANAN, Trustee

1201-2 Wallace S. Building **Tampa, Florida**

When writing advertisers, please mention ROCK PRODUCTS

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 128

Conveyors and Elevators
Barber-Greene Co.
R. H. Beaumont Co.
Fuller Company
Good Roads Machy. Co., Inc.
Huron Industries, Inc.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
W. A. Jones Fdy. & Machine Co.
Link-Belt Co.
Polysius Corp.
F. L. Smidth & Co.
Smith Engineering Works.
Stephens-Adamson Mfg. Co.
W. Toepfer & Sons Co.
Traylor Eng. & Mfg. Co.
Webster Mfg. Co.
Williams Patent Crusher & Pulverizer Co.
T. B. Wood's Sons Co.

Coolers (See Kilns and Coolers, Rotary)

Core Drilling (See Drills—Diamond Core)

Correcting Basins
F. L. Smidth & Co.

Couplings (Flexible and Shaft)
De Laval Steam Turbine Co.
Huron Industries, Inc.
W. A. Jones Fdy. & Machine Co.
T. B. Wood's Sons Co.

Couplings (Friction)
T. B. Wood's Sons Co.

Couplings (Hose, Pipe, Etc.)
Chicago Pneumatic Tool Co.

Cranes (Crawler and Locomotive)
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Insley Mfg. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Thew Shovel Co. (Electric, Gasoline & Steam)

Crusher Protectors
Dings Magnetic Separator Co.

Crushers (Hammer)
Pennsylvania Crusher Co.
Williams Patent Crusher & Pulverizer Co.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co.
Alloy Steel & Metals Co.
Austin Mfg. Co.
Earle C. Bacon Co. (Jaw)
Good Roads Machy. Co., Inc.
Polysius Corp.
Smith Engineering Works.
Traylor Eng. & Mfg. Co.

Crushers (Rotary)
J. B. Ehrsam & Sons Mfg. Co.
Polysius Corp.

Crushers (Single Roll)
Jeffrey Mfg. Co.
Link-Belt Co.
McLanahan-Stone Machine Co.

Crushing Rolls
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Polysius Corp.
Traylor Eng. & Mfg. Co.

Cutting Apparatus
Haynes Stellite Co.

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S. Flory Mfg. Co.
Mundy Sales Corp.
G. H. Williams Co.

Detonators
Hercules Powder Co.

Dewatering Machines
Chicago Pneumatic Tool Co.

Diamond Core Drilling (See Drilling—Diamond Core)

Dippers and Teeth (Steam Shovel)
American Manganese Steel Co.
Bucyrus-Erie Co.
Marion Steam Shovel Co.
Orton Crane & Shovel Co.
Thew Shovel Co. (Steam Shovel)

Ditchers
Barber-Greene Co.
Insley Mfg. Co.
Marion Steam Shovel Co.

Draglines
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Insley Mfg. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Monighan Machine Co.
Northwest Engineering Co.
Orton Crane & Shovel Co.
Thew Shovel Co.

Dragline Excavators
Marion Steam Shovel Co.
Northwest Engineering Co.
Orton Crane & Shovel Co.
Thew Shovel Co. (Electric, Gasoline & Steam)

Dragline Cableway Excavators
R. H. Beaumont Co.
Bucyrus-Erie Co.
Good Roads Machy. Co., Inc.
Link-Belt Co.
Marion Steam Shovel Co.
Mundy Sales Corp.
Novo Engine Co.
Sauerman Bros.
G. H. Williams Co.

Dredge Chain (See Chain)

Dredge Pipe (See Pipe)

Dredges
Bucyrus-Erie Co.
S. Flory Mfg. Co.
Marion Steam Shovel Co.
Mundy Sales Corp.

Drill Sharpening Machines
Armstrong Mfg. Co. (Well Drill Bits)
Gardner-Denver Co.

Drill Steel
Chicago Pneumatic Tool Co.
Gardner-Denver Co.

Drilling Accessories
Gardner-Denver Co.
Loomis Machine Co.

Drills (Blast Hole)
Armstrong Mfg. Co.
Loomis Machine Co.

Drills Hammer (See Hammer Drills)

Drills (Rock)
Chicago Pneumatic Tool Co.
Electro Metallurgical Sales Corp.
Gardner-Denver Co.

Drills (Well) (See Drills, Blast-Hole)

Drives (See Gears, Chain Drives, etc.)

Drives (Short Center)
T. B. Wood's Sons Co.

Dryers
Allis-Chalmers Mfg. Co.
Bonnot Co.
McGann Mfg. Co., Inc.
Polysius Corp.
Raymond Bros. Impact Pulv. Co.
W. A. Riddell Co.
Ruggles-Coles Div. of Hardinge Co., Inc.
Traylor Eng. & Mfg. Co.
Vulcan Iron Works

Dust Arresters
American Foundry Equip. Co.
New Haven Sand Blast Co.
Northern Blower Co.
Pangborn Corp.
W. W. Sly Mfg. Co.

Dust Blowers
Northern Blower Co.

Dust Collecting Systems
Allis-Chalmers Mfg. Co.
American Foundry Equip. Co.
New Haven Sand Blast Co.
Northern Blower Co.
Pangborn Corp.
Polysius Corp.
W. W. Sly Mfg. Co.

Dust Conveying Systems
Northern Blower Co.
Fuller Company

Dynamite
Hercules Powder Co.

Electric Cables and Wires
Rome Wire Co.

Electric Drills (Portable)
Chicago Pneumatic Tool Co.

Electric Hauling Systems
Geo. D. Whitcomb Co.

Electric Power Equipment
Allis-Chalmers Mfg. Co.

Elevator Belting (See Belting)

Elevators (See Conveyors and Elevators)

Engineers
Arnold & Weigel.
Bonnot Co.
J. C. Buckbee Co.
Burrell Eng. & Const. Co.
H. K. Ferguson Co.
Robt. W. Hunt Co.
Kritzer Co.
H. Miscampbell.
F. L. Smidth & Co.
Webster Mfg. Co.
Williams Patent Crusher & Pulverizer Co.

Engines (Diesel)
Chicago Pneumatic Tool Co.

Engines (Gasoline, Kerosene and Oil)
Mundy Sales Corp.
Novo Engine Co.

Engines (Steam)
Mundy Sales Corp.

Excavating Machinery (See Shovels, Cranes, Buckets, etc.)

Explosives
Hercules Powder Co.

Fans
Northern Blower Co.
Vulcan Iron Works

Fans (Exhaust)
New Haven Sand Blast Co.
W. W. Sly Mfg. Co.

Feeders
Traylor Vibrator Co.

Filters (Air)
Northern Blower Co.

Filters (Cement Slurry)
United Filters Corp.

Filter Cloth
United Filters Corp.

Forges (Oil)
Gardner-Denver Co.

Forgings (Steel)
Alloy Steel & Metals Co.
Coates Steel Products Co.

Frogs and Switches
American Manganese Steel Co.
Easton Car & Construction Co.
Koppel Industrial Car & Equipment Co.
Morrison & Risman Co., Inc.

Furnaces
Raymond Bros. Impact Pulv. Co.

Fuses (Detonating and Safety)
Ensign-Bickford Co.

Gasoline Engines—See Engines (Gasoline, Kerosene and Oil)

Gasoline Tanks (See Tanks—Gasoline)

Gears (Machine Molded)
Vulcan Iron Works

Gears (Spur, Helical, Worm)
De Laval Steam Turbine Co.
Farrel-Birmingham Co., Inc.
W. A. Jones Fdy. & Machine Co.
Webster Mfg. Co.

Gears and Pinions
American Manganese Steel Co.
Farrel-Birmingham Co., Inc.
W. A. Jones Fdy. & Machine Co.
Stephens-Adamson Mfg. Co.
Vulcan Iron Works.
Webster Mfg. Co.

Gear Reducers
Farrel-Birmingham Co., Inc.
Huron Industries, Inc.
W. A. Jones Fdy. & Machine Co
Webster Mfg. Co.

Generators (Acetylene)
Haynes Stellite Co.

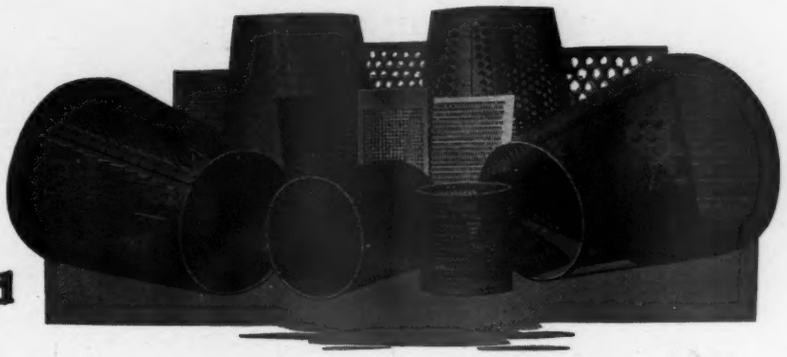
Generators (See Motors and Generators)

Grab Bucket Cranes (See Cranes)

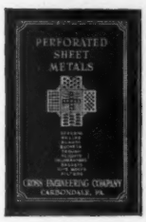
Cross Screens

&

Perforated Metals



Rush Orders Filled Promptly



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Send for our new catalog; just off the Press.

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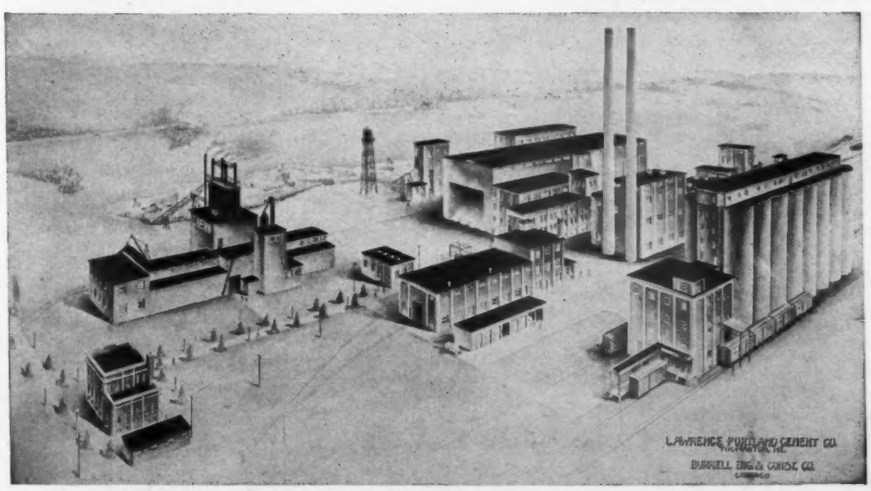

Designers and Builders of

Cement Plants, Stone Crushing Plants, Lime and Gypsum Plants, and Associated Buildings

Our artist's conception of the plant under construction for Lawrence Portland Cement Company, Thomaston, Maine, noteworthy because plant is practically concrete throughout

A PARTIAL LIST OF OUR CLIENTS

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Blue Mountain Stone Co.
Colorado Portland Cement Co.
Coplay Cement Mfg. Co.
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Hoosac Valley Lime Co.
Huron Portland Cement Co.
Indiana Portland Cement Co.
International Cement Co.
Lawrence Portland Cement Co.
Lehigh Portland Cement Co.
Louisville Portland Cement Co.
Louisiana Portland Cement Co.
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Nazareth Cement Co.
New York Trap Rock Co.
Newaygo Portland Cement Co.
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Southern Cement Co.
Tomkins Cove Stone Co.
United States Portland Cement Co.
United States Gypsum Co.
Utica Hydraulic Cement Co.
Volunteer Portland Cement Co.
Wellston Iron Furnace Co.

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Grab Buckets—See Buckets (Grab, Clamshell, etc.)

Graphite (Lubricating)
Acheson Graphite Co.

Graphite Powders
Acheson Graphite Co.

Grapples (Stone)
G. H. Williams Co.

Grating (Steel)
Kerlow Steel Flooring Co.

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Acheson Graphite Co.

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Traylor Eng. & Mfg. Co.
Traylor Vibrator Co.
Webster Mfg. Co.

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Polysius Corp.
Traylor Vibrator Co.

Guard Rails
Koppel Industrial Car & Equipment Co.

Guns (Hydraulic)
Georgia Iron Works

Gypsum Plaster Plants
J. B. Ehrsam & Sons Mfg. Co.

Gyrating Screens (See Screens)

Hammer Drills
Chicago Pneumatic Tool Co.
Gardner-Denver Co.

Hammer Mills (See Crushers)

Hangers (Shaft)
T. B. Wood's Sons Co.

Hoists
Chicago Pneumatic Tool Co.
S. Flory Mfg. Co.
Gardner-Denver Co.
Link-Belt Co.
Mundy Sales Corp.
Northwest Engineering Co.
Novo Engine Co.
Sauerman Bros.
Smith Engineering Works
Vulcan Iron Works.
Webster Mfg. Co.

Hose Couplings (See Couplings, Hose, Pipe)

Hose (Water, Steam, Pneumatic and Air Drill)
Chicago Pneumatic Tool Co.
New York Rubber Corp.

Hydrators (Lime)
Arnold & Weigel.
Jackson & Church Co.
Kritzer Co.
McGann Mfg. Co., Inc.
H. Miscampbell
Vulcan Iron Works

Hydraulic Guns (See Guns, Hydraulic)

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
Bonnot Co.
Hardinge Co.
McGann Mfg. Co., Inc.
Polysius Corp.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Vulcan Iron Works.

Kilns (Shaft)
Arnold & Weigel.
McGann Mfg. Co., Inc.
H. Miscampbell.
Vulcan Iron Works.

Kominuters (See Mills)

Laboratories (Magnetic)
Dings Magnetic Separator Co.

Lights (Portable Acetylene)
Union Carbide Sales Co.

Lime Handling Equipment
Arnold & Weigel.
Fuller Company
Kritzer Co.
Link-Belt Co.
H. Miscampbell.
Raymond Bros. Impact Pulv. Co.
Webster Mfg. Co.

Lime and Hydrating Plants
Arnold & Weigel.
McGann Mfg. Co.
Vulcan Iron Works

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Huron Industries, Inc.
W. A. Jones Fdy. & Machine Co.
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Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Webster Mfg. Co.
G. H. Williams Co.

Locomotive Cranes (See Cranes)

Locomotives (Steam, Gas and Electric)
Fate-Root-Heath Co. (Gas).
Lima Locomotive Works (Steam).
Plymouth Locomotive Works (Gas).
Vulcan Iron Works
Geo. D. Whitcomb Co.

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Geo. D. Whitcomb Co.

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Acheson Graphite Co.

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Harrington & King Perforating Co.

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Dings Magnetic Separator Co.

Magnetos
Eisemann Magneto Corp.

Magnets
Dings Magnetic Separator Co.

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Electro Metallurgical Sales Corp.

Manganese Steel (Plate and Sheets)
Electro Metallurgical Sales Corp.

Manganese Steel Castings
Electro Metallurgical Sales Corp.

Metals (Alloys, See Alloys, Babbitt Metal, Manganese Steel, Steel, etc.)

Mills, Grinding (Ball, Tube, etc.) (See also Crushers, Hammer)
Allis-Chalmers Mfg. Co.
Alloy Steel & Metals Co.
American Manganese Steel Co.
Bonnot Co.
Electro Metallurgical Sales Corp.
Hardinge Co.
Jackson & Church Co.
Polysius Corp.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Williams Patent Crusher & Pulverizer Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
American Manganese Steel Co.
F. L. Smidth & Co.

Mining Engineers (See Engineers)

Motors and Generators (Electric)
Allis-Chalmers Mfg. Co.

Nuggets (Tubemill, Grinding)
Coates Steel Products Co.

Oil Burners
Chicago Pneumatic Tool Co.

Oil Burning Equipment
Electro Metallurgical Sales Corp.
Raymond Bros. Impact Pulv. Co.

Oil Forges
Gardner-Denver Co.

Oilers
Traylor Vibrator Co.

Oilers (Air Line)
Gardner-Denver Co.

Ore Jigs
McLanahan-Stone Machine Co.

Oxy-Acetylene Apparatus
Haynes Stellite Co.

Perforated Metal
Cross Engineering Co.
Harrington & King Perforating Co
Hendrick Mfg. Co.
W. Toepfer & Sons Co.

Pile Drivers
Bucyrus-Erie Co.

Pipe Flanges
Georgia Iron Works

Plug Valves (See Valves)

Pneumatic Drills (See Drills)

Poidometers
Schaffer Poidometer Co.

Portable Conveyors
Austin Mfg. Co.
Barber-Greene Co.
Fuller Company
Link-Belt Co.
Stephens-Adamson Mfg. Co.

Powder (Blasting)
Hercules Powder Co.

Protectors (Crushers)
Dings Magnetic Separator Co.

Pulleys
Huron Industries, Inc.
T. B. Wood's Sons Co.

Pulleys (Friction Clutch)
W. A. Jones Fdy. & Machine Co.
Webster Mfg. Co.
T. B. Wood's Sons Co.

Pulleys (Magnetic) (See Magnetic Pulleys)

Pulverizers (See also Crushers, Mills, etc.)
Allis-Chalmers Mfg. Co.
Bonnot Co.
Hardinge Co.
Polysius Corp.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulverizer Co.

Pumps (Air Lift)
Chicago Pneumatic Tool Co.
Fuller Co.
Pennsylvania Pump & Comp. Co.

Pumps (Cement Slurry)
American Manganese Steel Co.
Electro Metallurgical Sales Corp.
Fuller Co.
Polysius Corp.
F. L. Smidth & Co.
A. R. Wilfley & Sons.

Pumps (Centrifugal)
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
De Laval Steam Turbine Co.
Novo Engine Co.
Pennsylvania Pump & Comp. Co.
A. R. Wilfley & Sons.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Georgia Iron Works
Traylor Vibrator Co.
A. R. Wilfley & Sons.

Quarry Development
Electro Metallurgical Sales Corp.

Rails
Easton Car & Construction Co.
Koppel Industrial Car & Equipment Co.
Morrison & Risman Co., Inc.

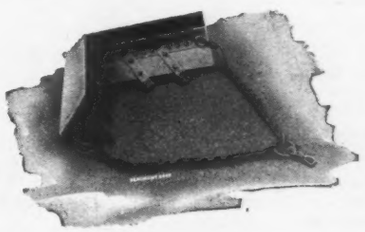
Railway Equipment
Electro Metallurgical Sales Corp.

Beaumont Cable Drag Scrapers

The Beaumont Scraper is structurally rigid. The patented basic principle is such that the sides do not have to be held apart to prevent their collapse in tough digging.

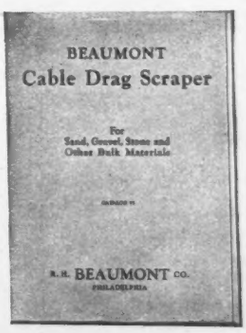
The design is such that the entire cutting parts shear through the material —100% shear cut—therefore less power is used to do the work.

READ WHAT THESE MEN SAY:



"*delivers more material with less power than any device we have used*"—says Roy Gage, Engineer of the Board of County Road Commissioners, Lapeer County, Mich. He ought to know.

"*and we have doubled our sales.*" So says Mr. R. H. Eastwood of the Eastwood Sand & Gravel Works. They installed a Beaumont Scraper to stock surplus output for winter sales.



Write for this catalog. 32 pages of tables and illustrations showing the application of our scrapers to various problems in addition to data on hoists, scrapers, blocks, bin gates, etc. Write for it today.

R·H· BEAUMONT CO.

313 Arch St., Philadelphia, Pa. **1544-C Straus Bldg., Chicago, Ill.**

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

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Smith Engineering Works

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Thew Shovel Co.

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Marion Steam Shovel Co.

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Traylor Vibrator Co.

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Eagle Iron Works
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Electro Metallurgical Sales Corp.
Koppel Industrial Car & Equipment Co.
Vulcan Iron Works.

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Mundy Sales Corp.
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Williamsport Wire Rope Co.

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A. Leschen & Sons Rope Co.
John A. Roebling's Sons Co.

Wire (Welding)
Haynes Stellite Co.

Worm Gears (See Gears)

Zinc
New Jersey Zinc Co.

A rigid cast-steel bridge above-

Double rigidity to overcome all pulling-in stresses

a heavy steel digging lip below

USE THE WILLIAMS "DOUBLE-ARCH" DRAGLINE—the bucket that has the strength and stamina to stand years of hard digging without drawing in at the sides.

Correct distribution of weight to give greatest digging power for each job—your Williams "Double-Arch" Dragline cuts at the right angle, and bites right in the instant the drag cable is taut.

Glad to send you our Bulletin "DS-1" which gives many other reasons why the Williams "Double-Arch" Bucket gives you better results in dragline work.

Drop us a line for this Bulletin.

And in the complete Williams line of Clamshell Buckets, there's one especially designed to do your excavating or rehandling—"Built to Dig, and Last While Digging."

G. H. WILLIAMS COMPANY
614 Haybarger Lane
Erie, Pa.

Branch Offices:
New York *Pittsburgh*
Cleveland *Chicago*

WILLIAMS
FAST-DIGGING BUCKETS

Rugged Construction
means Long Time Service

Highest in Efficiency, Lowest in Cost

IN the design and construction of the Improved Type "C" one of our chief aims has been to build a screen of the greatest possible simplicity and strength.

There is nothing complicated about the Universal. In fact, simplicity is one of its great virtues. There are no frictional surfaces such as ratchets, eccentrics, cams, or knockers to cause trouble on this screen. There are but two bearings, and these are absolutely trouble-proof, due to the fact that they are 100% oversize. The frame members, too, are exceptionally sturdy and made of the best materials obtainable for the purpose.

Simplicity and ruggedness of Universal Vibrators provide uninterrupted operation with minimum maintenance costs.

UNIVERSAL VIBRATING SCREEN CO.
RACINE ~ ~ WISCONSIN

Large production on standard sized units permits a lower price on Universal Vibrators. Write for catalog No. 70.

NORBLO

Dust Collecting Equipment

In the packhouse of the Phoenix Portland Cement Co. The packing operation made dustless by NORBLO

OPERATING conditions in NORBLO equipped cement plants represent a tremendous advance over the old days when dust was considered a necessary evil. The above photograph, showing the interior of the packhouse in the Phoenix Portland Cement Company, is evidence bearing out this statement.

Any cement mill—old or new—can have the same dustless conditions that prevail here. And in the same way, too—with NORBLO Dust-Collecting Equipment.

Whatever your need—there's a NORBLO System to give you the kind of results you've always wanted.

THE NORBLO GUARANTEE

We will give you complete satisfaction, and we positively guarantee NORBLO Equipment to conform to the requirements of your State Sanitary Laws and to be unsurpassed in construction and operation for the class of work for which it is intended.

Write us for full details on NORBLO—
No obligations

NORTHERN BLOWER CO.

West 65th St. and Denison, CLEVELAND

A Quarry Blast that Brought Results

SEVENTY thousand tons of rock laid ready for the steam shovel. The result of a blast made at the quarry of the Hercules Cement Corporation, Stockertown, Pa. The rock was well broken—with a tonnage of 3.5 tons of rock per pound of explosives used. The cost of explosives amounted to 4.1 cents per ton of rock broken.

Cordeau-Bickford—both plain and countered—was used, with the result that the entire charge was detonated *instantly*.

CORDEAU
DETONATING FUSE
BICKFORD

Furnished by Ensign-Bickford, or any of the explosives companies

THE ENSIGN-BICKFORD COMPANY
SIMSBURY, CONNECTICUT

Original Manufacturers of Safety Fuse—Established 1836

Coast Mfg. & Supply Co. Livermore, Cal.

Western Distributors: National Fuse & Powder Co. Denver, Colo.

Canadian Distributors: Canadian Safety Fuse Co. Brownsburg, P. Q.

Everywhere: Any of the Powder Companies

No Complication to Shay Maintenance

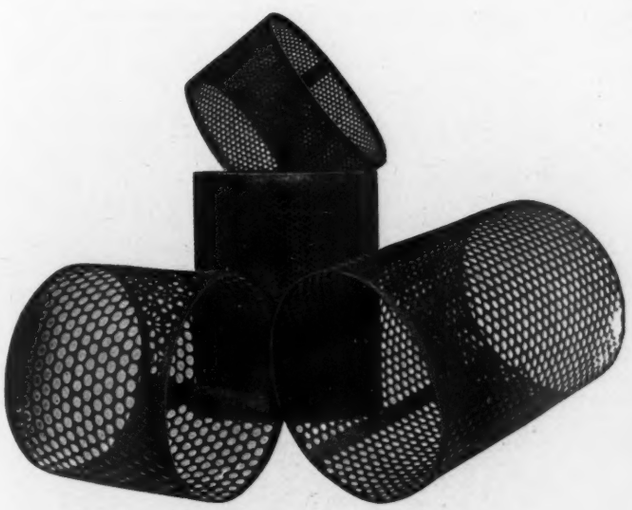
BECAUSE of its simple and sturdy design, with all parts readily accessible, the Shay Geared Locomotive is easily kept in excellent running order, without the need for extensive machine shop facilities and drop pits.

"We do not have a machine shop," writes a certain stone company. "Our engineers do all the repair work, keeping our Shays in running order, so our repair bills are very low."

Shays are so free from complications in design and construction that they are readily operated and maintained in good condition.

Write for a Shay Catalog

LIMA LOCOMOTIVE WORKS
Incorporated
Lima, Ohio 17 East 42nd St., New York



Toepfer screens

THE skill in design and workmanship, and the superior quality of material that goes into the production of Toepfer Screens is the heritage of nearly three-quarters of a century of successful manufacture.

Uniform high quality of Toepfer products has become a tradition zealously upheld and guarded by the master workmen of our Perforated Metals Department. This long period of continuous production will be readily appreciated as evidence of the unvarying quality that characterizes Toepfer Products.

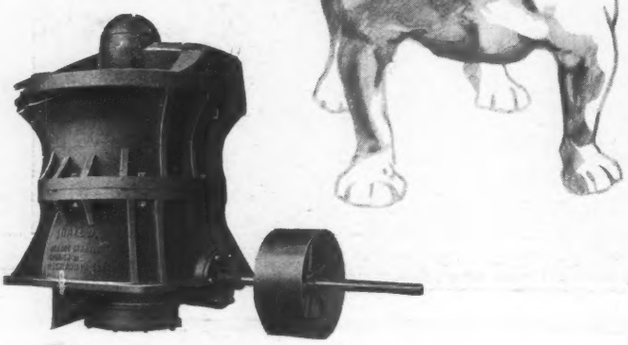
We are prepared to handle your every want in the line of Perforated Metal Screens.

TOEPFER PRODUCTS
Sand Washers, Elevators, Bin Gates, Washing Screens, Feeders, Grizzlies, Conveyors, Perforated Metals.

W. TOEPFER & SONS COMPANY
Milwaukee **Wisconsin**

TRAYLOR

bulldog



Gyratory Crusher

OUR long experience in designing and building stone crushing equipment has been utilized to the fullest in producing a gyratory capable of meeting every need of operators.

Hundreds of Bulldogs are in daily service throughout the stone and cement industries—and in every instance their operation has been characterized by long, trouble-free and economical service.

Many exclusive Traylor features combine to make this machine the last word in its field.

Just ask for Bulletin No. 1100

TRAYLOR ENGINEERING AND MFG. CO.
Allentown, Penna.

NEW YORK 30 Church St. | CHICAGO 1414 Fisher Bldg. | LOS ANGELES 362 I. W. Hellman Bldg.
SALT LAKE CITY 100 W. 2nd South St. | SEATTLE 815 Alaska Bldg.

TIMMINS, ONTARIO, CANADA, Moore Block

Export Department, 104 Pearl St., New York City—Cable Address: "Forsaltra"
Foreign Sales Agencies: London, Rangoon, Johannesburg, Lima, Rio de Janeiro, Sao Paulo, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro
European Works—Usines Carels Freres, Ghent, Belgium

THE ONLY SURE CRUSHER PROTECTION IS DINGS PROTECTION

You might crush iron - but NOT steel

TRAMP iron may succumb to the force of your crusher jaws, but tramp steel—broken-off drill heads, shovel teeth, picks, can tear out the crusher's vitals. Can you risk heavy financial loss, expensive machinery to be repaired or replaced, a plant shut down for days, maybe weeks?

Against this ever-present danger there is only one certain protection—Dings protection. Dings Magnetic Separators seize and throw the iron and steel away from the crusher—damage is impossible.

Don't wait for a plant tie-up before you investigate the economy of Dings.

Dings Magnetic Separator Co.
803 Smith Street, Milwaukee, Wis.
Established in 1899

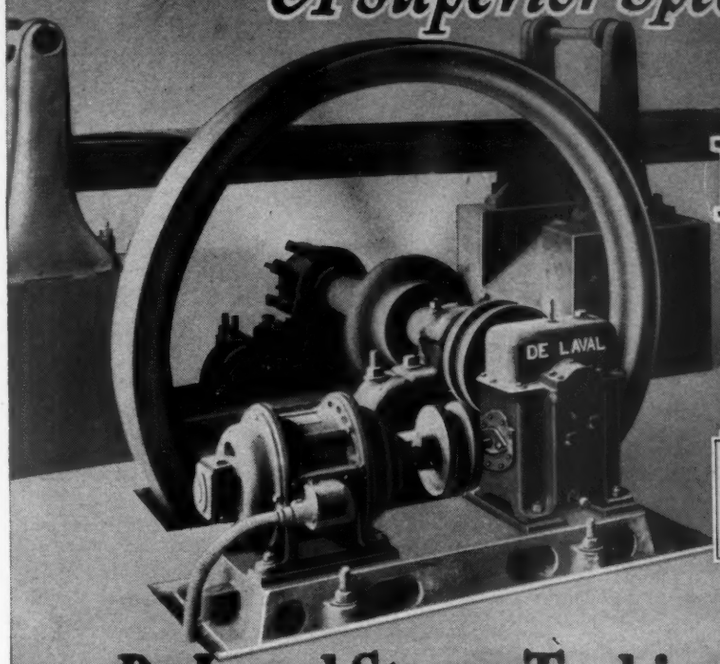
New York 30 Church Street | Seattle 2208 First Ave. South
Boston 304 Rice Bldg. | San Francisco 419 Call Bldg.
Branch Offices in Principal Cities

Dings High Intensity MAGNETIC SEPARATION

RP 3-31-Gray

De Laval Worm Gear

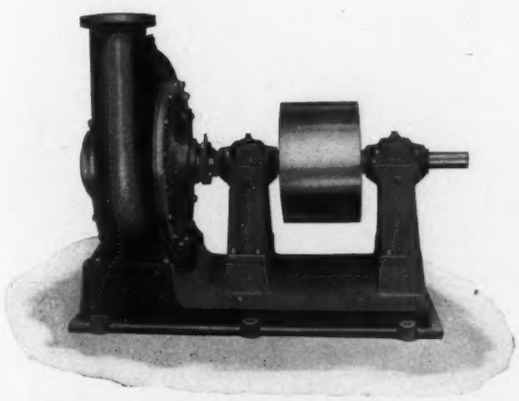
A Superior Speed Reducer for Heavy Rough Drives



This 14½ to 1 ratio gear is transmitting 7½ HP. from a 900 RPM. motor to a skipulter in a cement mill.
Ask for Catalog R.

De Laval Steam Turbine Co., Trenton, N. J.

A NEW TYPE SAND PUMP



6 inch Right Hand Top Discharge Type B Belt Driven Sand and Dredging Pump
Shipping weight 2,600 lbs. Floor space 2'-9" x 4'-8"

THE accompanying cut shows a new type pump developed to meet conditions of service that are too severe and heavy for the standard type of belt driven sand pumps.

The design and construction are such that while heavy and rigid, the cost is much less than the strictly heavy duty type and but slightly in advance of the standard type. These pumps (at present built in 6-in. and 8-in. sizes only) carry a number of highly desirable features and have met with much favor among experienced users.

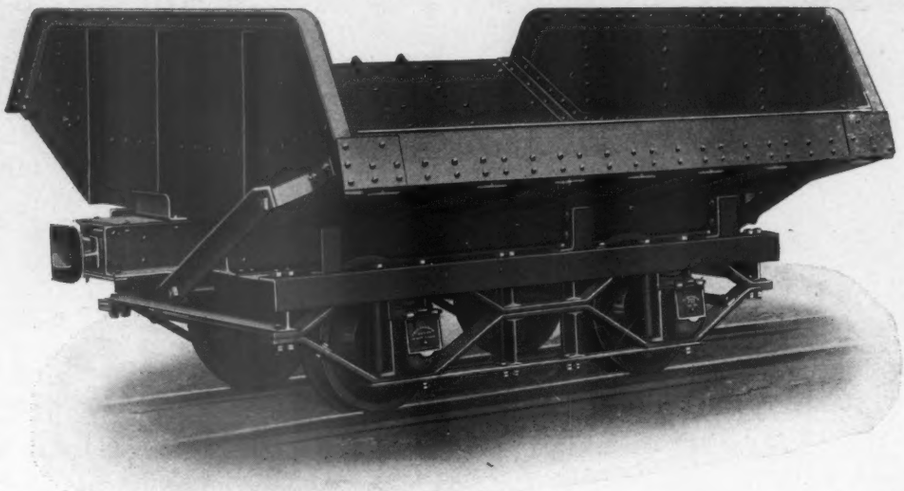
These pumps can be supplied in right hand or left hand with position of discharge top or bottom. Extended shaft is furnished so that direct connection can be made if desired.

Prices and descriptive sheets sent on request

GEORGIA IRON WORKS

AUGUSTA, GEORGIA
Established 1891

BUILT STRONGER—*then* RE-INFORCED



THAT, in brief, tells the story of CONTINENTAL CARS. It explains their great ruggedness, long life, low maintenance, and all-around utility—characteristics which have combined to make them the first choice of a large number of operators who use car haulage methods.

Every part and member of CONTINENTAL CARS are made of the very best materials available for each purpose—with adequate bracing and reinforcing at those points subject to the most wear or strain. The trucks are ***all-steel,*** and of such strength as to withstand without strain twice the load they are intended to carry.

The wheels are made according to M. C. B. specifications—of larger size than ordinary—to permit easier moving and the handling of more cars in a train.

Write for complete catalog showing all types of CONTINENTAL CARS

KENTUCKY WAGON MANUFACTURING COMPANY, LOUISVILLE, KENTUCKY

STONORE

SPECIAL HEAVY DUTY

ELEVATING & CONVEYING

BELTS

Built of the best obtainable materials for the uninterrupted handling of broken and crushed stone and for the most severe quarry use. Lighter belting for less exacting requirements.

NEW YORK RUBBER CORP.

ESTABLISHED 1851

BEACON, NEW YORK

New York Office
19 West 44th Street

Chicago Office
644 West Washington Blvd.

Even though the track is frozen in and covered with snow, several men are doing the work ordinarily done by a large track gang.

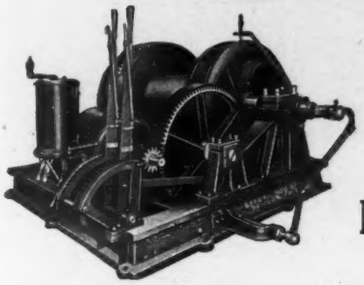
Shifting Track in a Quarry

IN large quarries where track must be moved frequently at the face, or on the dump pile, the Track Machine will prove a great labor and time saver. On this job the machine paid for itself out of labor savings in 86 days of operation. Write for Bulletin KS-8.

Nordberg Mfg. Co., Milwaukee, Wis.

THE NORDBERG PATENTED
TRACK MACHINE

FLORY HOISTS



POWERFUL

RUGGED

DEPENDABLE

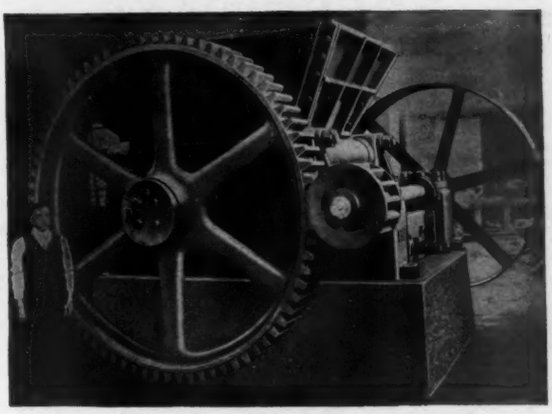
When your hoist is the only means of handling material be sure it's dependable, for when it breaks down, your entire operations cease. For more than half a century Flory Hoists have been noted for their dependability—their powerful, rugged construction. They are equipped with asbestos frictions, asbestos brakes, cut gears, etc. They are as near 100% perfect as a hoist can be.

Ask Any Flory User

Flory builds Steam, Electric, Gasoline, Belt Driven Hoists, Cableways, Carpullers, Dredging Machinery, Etc.

Sales Agents in Principal Cities

S. FLORY MFG. CO., Bangor, Pa.



IF you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.
Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.

The Gear with A Backbone

Has

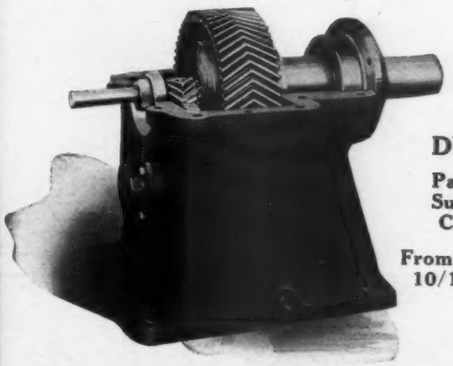
At Least 60% More Strength

At Least 15% More Bearing Surface

At Least 40% More Teeth in Contact Than Other Type Double Helical Gears

They Are Applied in Over 70 Different Designs of Reduction Units

Write for Literature



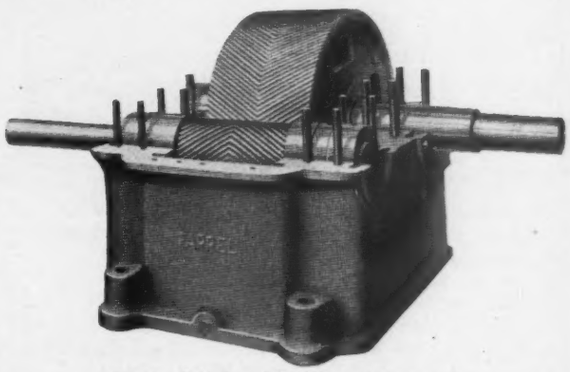
DV Series

Particularly Suitable for Conveyors

From 1 to 30 hp. 10/1 to 130/1 Ratio

Farrel-Sykes Heavy Duty Drives

Complete series of single, double and triple reduction units; Sykes gears on babbitt lined or roller bearings, supported on a base of box section, automatically lubricated, dustproof, oil tight. 97 to 98.9% mechanically efficient.



Typical Unit with Cover Removed

Farrel-Birmingham Company, Inc.

Successors to

Farrel Foundry & Machine Co., Ansonia, Conn., and Buffalo, N. Y., and Birmingham Iron Foundry of Derby, Conn. Address replies to this advertisement to Buffalo Plant, 344 Vulcan St., Buffalo, N. Y.

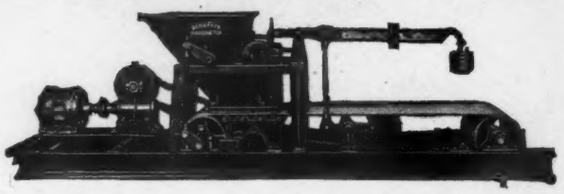
New Type Dust Arrestor

Patented and Patents Applied for

"Quality Equipment Pays in the End"

THE NEW HAVEN SAND BLAST CO.
New Haven, Conn. Cleveland, Ohio

SCHAFFER POIDOMETER



ALMOST HUMAN

Schaffer Poidometers are the mechanical brains of the plant. They are more than that—they are guardians of the quality standards you have set for your product—they prevent waste and assure accuracy and maximum economy.

If you are handling a variety of materials, arrange your Poidometers in batteries—set one for each material and for the proportion wanted—then forget it! The Poidometer will do your bidding better than your most loyal employee. If any machine is not getting its full quota of material, the entire battery will automatically stop. Space does not permit of a thorough explanation of the many cost-saving qualities of Schaffer Poidometers.

WRITE FOR FULL DETAILS

SCHAFFER POIDOMETER CO.
2828 Smallman, Pittsburgh, Pa.

From Alaska to Florida In Winter and Summer

GREDAG
LUBRICANTS

put a cushion between gear teeth, keep bearing surfaces apart, absorb shocks, resist pressures and prevent wear, without waste of power.

Grades for every purpose. Send for recommendations as made by leading manufacturers of power shovels, cranes, hoists and other material handling equipment.

Gredag contains Acheson Electric Furnace Graphite, 99.9% pure and characterized by its freedom from gritty impurities. It improves all metal surfaces and adds to the ruggedness of the grease body.

Write for fifty page descriptive catalogue, price list and nearest source of supply

ACHESON GRAPHITE COMPANY
Niagara Falls, N. Y.

LOCOMOTIVE OHIO CRANE

Steam—Gas—Electric

Hook, Clamshell, Dragline
Magnet or Pile Driver Service
10 to 50 Ton Capacities

The Crane with the 10 Year Guarantee
Catalog on Request

THE OHIO LOCOMOTIVE CRANE CO.
High Street, Bucyrus, Ohio

Crescents are on in a jiffy and on to stay—yet to shorten a Crescent joined belt is but a matter of a few minutes.

But the big advantage is that the belt will give its best service for its longest life without constant costly interruptions.

CRESCENT BELT FASTENER CO.

247 Park Avenue New York, N. Y.

CRESCENT BELT FASTENERS

Recommended by belting manufacturers as the best

Buckets You Buy

Buckets, while not the largest item of cost by any means, are worthy of careful attention and careful buying.

Shopping around for buckets may get you a low price but that's about all.

Buying from a reputable manufacturer like Hendrick gets you buckets at a ***reasonable*** price plus good quality, good workmanship, and good deliveries.

Buy from Hendrick.

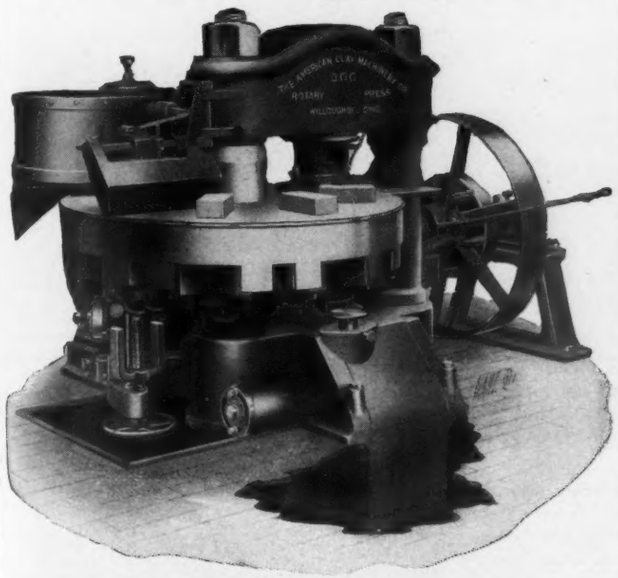
HENDRICK MANUFACTURING CO.

47 Dundaff St., Carbondale, Pa.

New York Office: 30 Church St.
Pittsburgh Office: 904 Union Trust Bldg.
Hazleton, Pa., Office: 738 West Diamond Ave.

Makers of Mitco Interlocked Steel Grating
Mitco Shur-Site Stair Treads and Mitco Armorgrids
Hendrick Perforated Metal Screens

On the Up-Grade

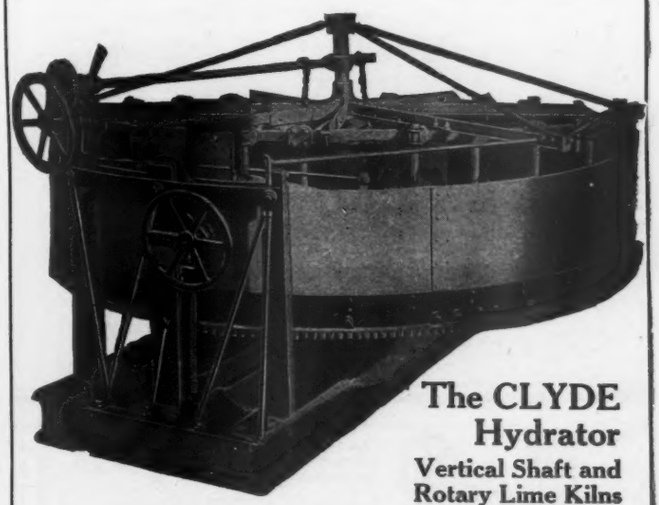


The Sand-Lime Brick market is definitely on the up-grade. Handsome profits await producers who get in early. Ask about our complete line of equipment for Sand-Lime Brick plants. No obligation.

W. A. RIDDELL COMPANY

Bucyrus, Ohio

Formerly Hadfield-Penfield Steel Co.



The CLYDE Hydrator

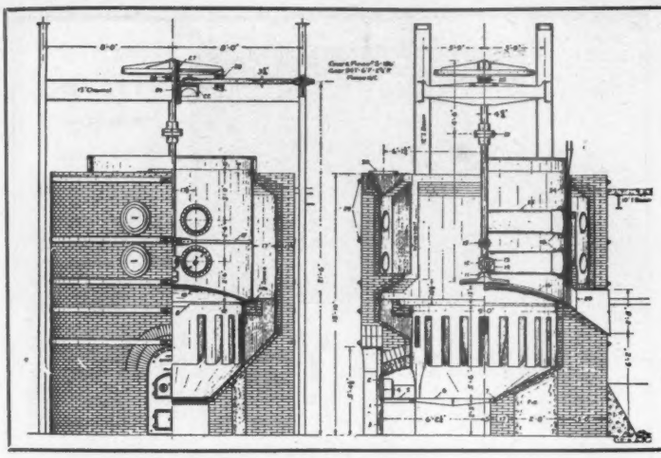
Vertical Shaft and Rotary Lime Kilns

THE "Clyde" is the respected veteran of the hydrator field. For years it has been known and used by the leading producers of hydrates—who have learned from first-hand experience that it is a machine worthy of every confidence. When in the market for a hydrator, it will pay you to investigate the Clyde.

H. MISCAMPBELL

Patentee and Sole Manufacturer

DULUTH Patented Aug. 14, 1923 Serial No. 1464722 MINNESOTA



Ever Dependable

EHRSAM Calcining Kettles—on their record—have won widespread recognition among producers of lime and gypsum plaster. Ehrsam Kettles are **standard of comparison** in this type of equipment. Their reputation for being **ever dependable** has won for them the complete confidence of the industry.

Complete Specifications on Request

The J. B. Ehrsam & Sons Mfg. Company
Enterprise, Kansas

For Sale! LOCOMOTIVES

Due to changes in equipment a large eastern company is able to offer at a bargain three steam locomotives. They are adapted for quarry, mill or industrial yard work.

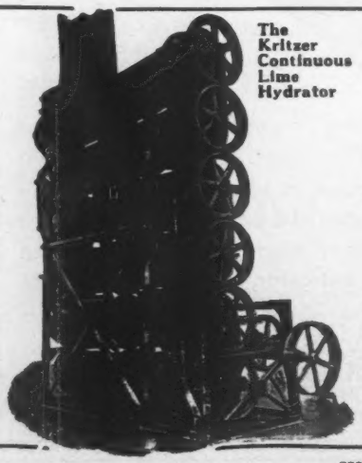
No. 1 Made by Amer. Loco. Co., 65 tons, four 44" driving wheels, standard gauge. Length bore 32", stroke 24", steam 165 lb. Boiler in good condition. Tender tank and trucks good. Steam brakes. Will be sold cheap.

No. 2 Made by Amer. Loco. Co., 65 tons approximately, four 44" driving wheels. Standard gauge. Length bore 32", stroke 24", steam 160 lbs. Boiler has new flue sheets, tender tank and trucks good condition. Steam brakes with air for cars. An economical engine for general work.

No. 3 Made by Lima Loco. Corp., 1919, Shay type, 60 tons, eight 38" driving wheels, standard gauge. Length bore 20", stroke 14". Steam 200 lbs. Boiler and tank A-1. A fine engine and comparatively new.

These locomotives are now in operation. They have been maintained in first-class condition through service by the owner's fully equipped machine shop. Address inquiries to Box 129, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

THE editorial library of Rock Products contains practically every obtainable treatise relating to the production of stone, sand, silica, phosphate rock, gypsum and other non-metallic minerals and on the manufacture of cement, lime, gypsum products, etc. The editors are technical men and are familiar with these books. Our library of manufacturers' literature is as complete and up-to-date as possible. Rock Products welcomes inquiries, and our facilities are ever at the disposal of our subscribers and advertisers.



The Kritzer Continuous Lime Hydrator

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY
515 West 35th Street CHICAGO, ILL.

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Important Economies in Cement Production

A SURVEY of your plant by Ferguson will result in recommendations pointing out important production economies. If you want estimates and suggestions for plant arrangement—constructive ideas on financing or reorganization—investigations and reports on raw materials—money-saving plans for use of standardized methods in construction and equipment, wire, write or phone for a Ferguson executive.

THE H. K. FERGUSON COMPANY
Hanna Building . . . Cleveland, Ohio
Phone: SUperior 3620
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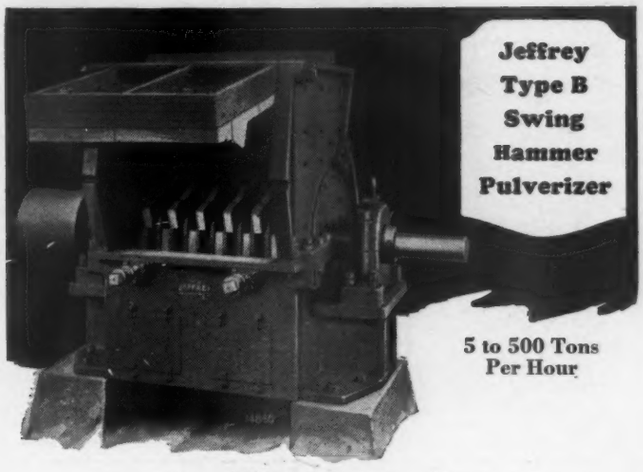
ENGINEERS



5 to 500 Tons Per Hour

Hammers That Give Maximum Wear

The hammers in the Jeffrey Type B Swing Hammer Pulverizers have four wearing faces which can be used in turn before any replacements are necessary.

Hinged cover plates on front and back give access to all parts and make extremely easy the removal or adjustment of the wearing parts.

Jeffrey Type B Swing Hammer Pulverizers are equipped with oversize ring oiling or the best radial ball bearings made.

Catalog 368-C describes Jeffrey Swing Hammer Pulverizers.

The Jeffrey Manufacturing Co.
935-99 N. Fourth St., Columbus, Ohio

GRATINGS and SAFETY STEPS

For Industrial, Marine and Architectural Purposes

Write for Catalogue F66E

KERLOW STEEL FLOORING COMPANY
218-224 Culver Avenue Jersey City, New Jersey

A complete line of brick machinery for plants of any desired capacity.

Over 700 brick plants now use Komnick Equipment.

The Komnick Process, together with the line of Komnick Sand-Lime Brick Machinery, is the up-and-coming money maker for the producer with surplus stocks of sand and lime.

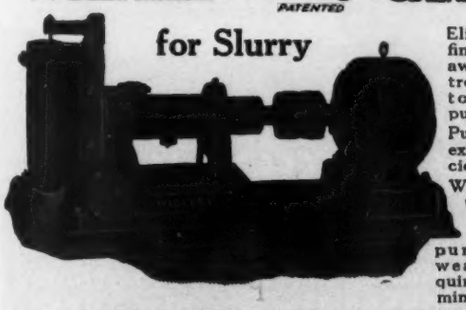
25,000 brick per day and up with the Komnick Process assures a production scale that will bring in steady and worthwhile profits. You are urged to investigate the Komnick way of transforming surplus materials into surplus profits.

KOMNICK MACHINERY COMPANY, Inc.
Lafayette Building, Detroit, Michigan

WILFLEY Centrifugal SAND PUMP

PATENTED

for Slurry



Elimination of stuffing box has done away with many troubles common to centrifugal pumps.

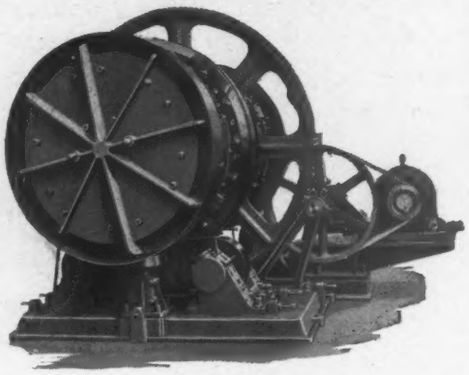
Pump maintains extraordinary efficiency.

Wearing parts unusually heavy, insuring long life.

Cleaning out pump or changing wearing parts requires only a few minutes.

Described and illustrated in our new Catalog No. 6

A. R. Wilfley & Sons, Inc., Denver, Colo., U. S. A.



ROD MILLS

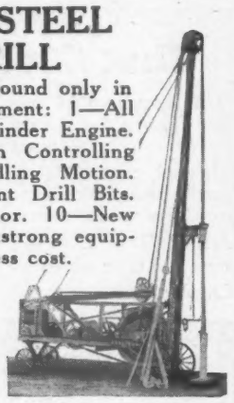
are used with success for grinding ores and other hard materials.

In Sand-Lime Brick plants, our machines give best results for grinding coarse sand and mixing it with lime in ***one*** operation.

Note the peripherical discharge which allows for free discharge of materials.

JACKSON & CHURCH
SAND LIME BRICK MACHINERY *Company* SAGINAW, MICH. U. S. A.

ARMSTRONG ALL STEEL BLAST HOLE DRILL



Ten outstanding exclusive Features found only in Armstrong Blast Hole Drilling Equipment: 1—All Steel Construction. 2—Multiple Cylinder Engine. 3—Wire Line Derrick. 4—Clutch Controlling Drilling Motion. 5—Improved Drilling Motion. 6—Bit Dressing Machine. 7—Patent Drill Bits. 8—Bit Furnace. 9—Magnetic Indicator. 10—New Chemical Solution. The use of Armstrong equipment insures greater production at less cost.

Write for "The Story of the Quarry"—a free book that gives the facts in regard to the Armstrong System of Blast Hole Drilling. Write us now.

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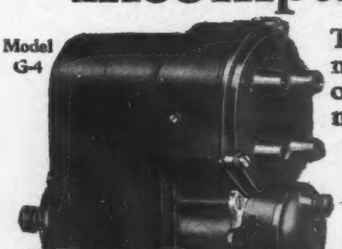
American Company's **Wire Rope** and **AERIAL** WIRE ROPE **TRAMWAYS**

AMERICAN STEEL & WIRE COMPANY

Sales Offices: Chicago, New York, Boston, Atlanta, Birmingham, Cleveland, Worcester, Philadelphia, Pittsburgh, Buffalo, Detroit, Cincinnati, Baltimore, Wilkes-Barre, St. Louis, Kansas City, Minneapolis-St. Paul, Oklahoma City, Memphis, Dallas, Denver, Salt Lake City, *San Francisco, *Los Angeles, *Portland, *Seattle. **United States Steel Products Co.*

Incomparable

Model G-4



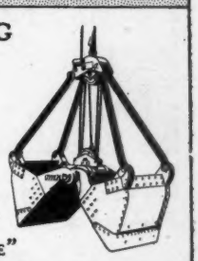
The world's premier magneto. Standard of the construction machinery industry.

EISEMANN

EISEMANN MAGNETO CORPORATION. 165 Broadway, N. Y.

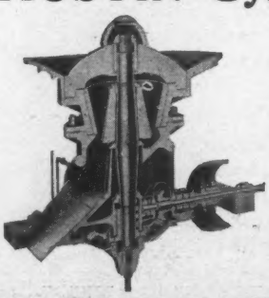
Owen Buckets

GREATER DIGGING POWER
FASTER OPERATION
LONGER LIFE
GUARANTEED AGAINST BREAKAGE
and
"A MOUTHFUL AT EVERY BITE"



THE OWEN BUCKET CO.
6021 BREAKWATER AVENUE CLEVELAND, OHIO

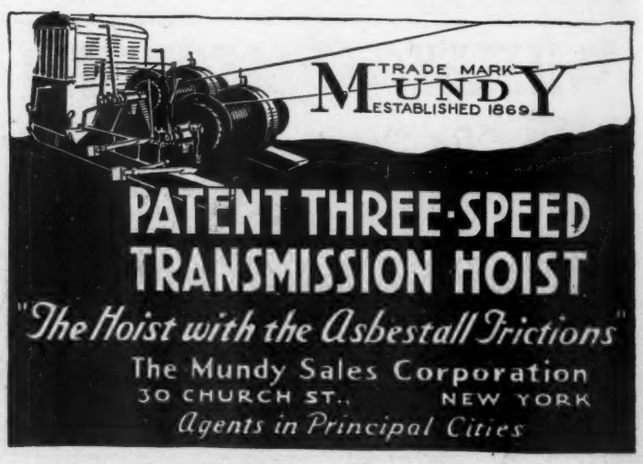
AUSTIN Gyratory Crusher



Every detail of engineering in the Austin crusher points to greater crushing strength and operating economy. It crushes the hardest material to any size, operates on minimum power and is protected from maintenance troubles.

A line from you will bring our catalog.

AUSTIN MANUFACTURING CO.
400 No. Michigan Ave., Chicago, Ill.

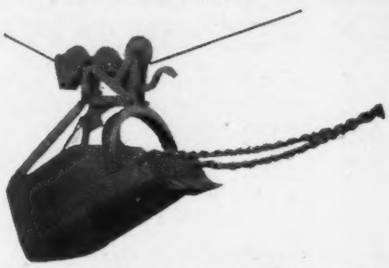


One Gravel Digging Unit Does the Work of Three on a One-Man Payroll

The Sauerman Slackline Cableway digs, raises and then conveys the materials — and only one man is needed to operate it. No distance from pit to plant is too great and production can be stepped up to as high as 4,000 cu. yds. per day (24 hours). Catalogue No. 9 is filled with drawings, pictures and descriptions. Write for it.

SAUERMAN BROS., Inc., 431 S. Clinton St., Chicago

INSLEY PRODUCTS



Slackline
Cableways
Bin Gates
Cars
Gasoline
Shovels
and Cranes

INSLEY MANUFACTURING COMPANY Indianapolis

Engineers and Manufacturers

American DUST ARRESTERS

(CLOTH SCREEN TYPE)

FOR THE SUPPRESSION AND COLLECTION OF ALL FINE DRY DUSTS ~ ~
OUR EXPERIENCED ENGINEERING SERVICE IS AVAILABLE ~ ~ ~

The American Foundry Equipment Company
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Since 1854

my firm has been the leading manufacturer of automatic machines and complete plants for the production of

SAND LIME BRICK

DR. BERNHARDI SOHN

Machine Works Eilenburg 3, Germany

J. C. BUCKBEE COMPANY

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FIRST NATIONAL BANK BUILDING
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Builders of Cement, Rock Crushing and Gravel Plants for Twenty Years

DESIGN—CONSTRUCTION—OPERATION
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Crushing, Granulating, Pulverizing, Shredding, Air-Separating, Screening, Grading, Mixing, Weighing, Sampling, Elevating and Conveying Machinery

Standardized and special units ready to erect.

ENGINEERS, DESIGNERS, CONSULTANTS, ERECTORS, OPERATORS

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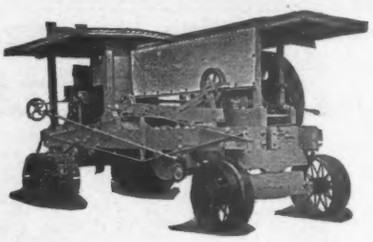
BACON ~ FARREL ORE & ROCK CRUSHING ~ WORLD KNOWN ROLLS ~ CRUSHERS

EARLE C. BACON, INC. ENGINEERS
26 CORTLANDT ST., NEW YORK



The "CLIPPER" late improved Blast Hole Drill. The "CLIPPER" predominates, has stood the test and is approved by critics. Furnished also in the round wheel.

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Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories

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Modern Blasting in Quarries and Open Pits

169 Pages

of interesting, practical and valuable information to quarrymen. We have a free copy for you. Write to

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THE MERRICK CONVEYOR WEIGHTOMETER

Any material which is conveyor-handled can be weighed without additional handling or loss of time by the Merrick Conveyor Weightometer.

An Automatic—Continuous—Accurate Record

MERRICK SCALE MFG. COMPANY
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McGANN MANUFACTURING COMPANY, INC
Engineers and Manufacturers
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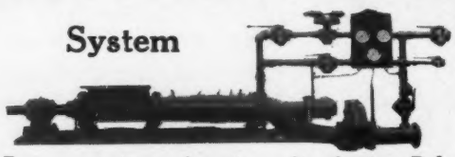
Oldest designers of lime plants and lime plant equipment in existence. We have specialized for many years in the design and construction of

Single and Double Shell, Rotary Dryers—Rotary and Shaft Type Lime Kilns—Hydrators—Complete Lime and Hydrating Plants.

YORK Kilns and Dryers
SCHULTHESS Hydrators

FULLER KINYON

System



For conveying—elevating—distributing Pulverized Materials through pipe lines of extended length.

Cement—Raw Material—Flue Dust—Packer Spill —Gypsum—Lime, Etc.

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HUM-MER Electric SCREEN

Screens from coarsest to the finest materials either wet or dry

Catalogue sent upon request

The W. S. TYLER COMPANY - Cleveland Ohio.

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HEAVY DUTY SCREENS

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DUSTY OPERATIONS MADE DUSTLESS BY PANGBORN

Consult us on any phase of Dust Suppression and Collection for any industrial operation.

Pangborn Corporation
Sand-Blast and Dust Suppression Equipment, Hagerstown, Md.

Quaker Belts meet every test

In hundreds of stone, sand, gravel, cement and lime plants in the United States, and operating under the hardest conditions, Quaker Rubber Belts—transmission and conveyor—are meeting every service test.

Their durability in the long run makes these high quality belts the most economical that can be obtained.

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Manufacturers of Daniel's P. P. P. Rod Packing
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QUARRY CARS

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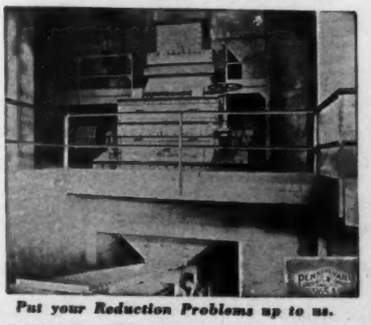

Put your Reduction Problems up to us.

STEELBUILT

preparing Primary Crusher output for pulverizing in one dependable reduction.

UNBREAKABLE STEEL FRAME.

ADJUSTABLE STEEL CAGE.

POSITIVE TRAMP IRON PROTECTION.

50 "Pennsylvania" types and sizes for Primary, Secondary and Finer reductions in cement, lime and gypsum plants.

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Liberty Trust Bldg. PHILADELPHIA
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Hardinge Mills
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Ruggles-Coles Dryers
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USED EQUIPMENT

FOR SALE

1—5'x6' Edison Giant Roll.
200 tons 60 lb. Relaying Rails.
1—2"x6" Laboratory Jaw Crusher.
1—Set 36"x30" Smooth Rolls.
1—Set 18"x24" Spike Rolls.
2—10' Morgan Gas Producers.
2—8'x6' Ball Mills.
1—No. 6 McCully Gyratory Crusher.
1—No. 7½ Kennedy Gyratory Crusher.
5—8'x125' Rotary Kilns.
1—9'x100' Rotary Kiln.
2—7'x100' Rotary Kilns.
1—7'x120' Rotary Kiln.
1—7½'x80' Rotary Kiln.
5—5'x50' Rotary Coolers or Dryers.

Equipment Sales Company
R. W. Storrs, Jr., Manager
Richmond, Virginia, and Benson Mines, N. Y.

Sell your discarded equipment! It's probably worth more than you realize. Try an advertisement in this section.

MOTOR

52 H.P. G. E. slip ring hoist type, 3 ph., 60 cy., 440 volts, 600 rpm. resistance and reversible drum controller.

DRILL SHARPENER

One I.-R. No. 5, with dies, ¾ in. to 1⅜ in.

AIR COMPRESSOR

One I.-R. 210 ft. portable gasoline engine driven.

BOILERS

Two Springfield Dry Back Scotch Marine type, 150 H.P. each, 135 lbs. steam, 96 in. diam. x 18 ft. long.

CRUSHERS

36x24 Farrell Jaw, Manganese fitted No. 5 Austin, Manganese fitted.

DUMP CARS

Thirty 4-yd. 36 in. ga. Western Steel Beam Portable Track, Rails, Cars, Steel Piling. In stock. Immediate shipment.

Hyman-Michaels Company
Peoples Gas Bldg. Chicago, Ill. — Railway Exchange St. Louis, Mo.

Sell your discarded equipment! It's probably worth more than you realize. Try an advertisement in this section.

32 ton, American, 32-in. wheel centers, 175 lbs. pressure, air and steam brakes; completely overhauled.

75 ton, 21x26-in., 6-wheel switcher, piston valve, Walschaert valve gear, superheated; built Dec., 1922.
50 ton, saddle tank, new boiler, new cylinders, new tank, new tires.
17—16-yd. Western dump cars, rebuilt; new bodies, steel lined floors.
10—20-yd. Western dump cars, all steel, vertical air cylinders.

HAVE FORTY LOCOMOTIVES, OVERHAULED AND READY, 5 TO 100 TONS, CARS, SHOVELS, CRANES, RAIL, ETC.

ALSO
LOCOMOTIVE SPRINGS, MANUFACTURED AT OUR WORKS HERE

SOUTHERN IRON & EQUIPMENT COMPANY
(Est. 1889)
ATLANTA - - - - - GEORGIA

FOR SALE

1—75 H.P. Electric Stripping Outfit.
1—Gas Portable Core Drill.
1—No. 3 Gates Gyratory Crusher with Screens.
1—No. 9-K Gates Gyratory Crusher.
2—No. 8-D Gates Gyratory Crushers.
1—No. 5 Telsmith Gyratory Crusher.
1—No. 7 Williams Fine Grinder.
1—No. 7½-D Gates Gyratory Crusher.
1—18"x36" Farrell Jaw Crusher.
1—36"x48" Traylor Bull Dog Crusher.
1—No. 6 Austin Gyratory Crusher.
2—No. 5-K Gates Crushers.
1—Complete 400 Yard Gravel Plant.
1—Complete Small Stucco Plant.
1—6'x22" Hardinge Conical Ball Mill.
1—41-ton Baldwin Standard Gauge Locomotive.
2—Complete ¾-yd. Gas Cableway Outfits; 1 steam.
1—Sauerman 1-yd. Outfit, without power.
1—Sauerman 2-yd. Electric Outfit, complete.
1—New 200 H.P. G. E. Motor.
1—65' Center Bucket Elevator.
50—Steam and Electric Channelers.
1—33" Fuller Mill.
1—3'x30' Indirect Fired Dryer.
1—42" Gas Whitcomb Locomotive.
1—150' Matthew Gravity Conveyor.

Send us your inquiries and we will send you our offerings from our $15,000,000 Listing.

National Equipment Company
Bloomington, Indiana

REBUILT LOCOMOTIVES

72-ton American 6-wheel switcher, separate tender, 180 lb. steam. Three duplicates.
54-ton Baldwin 6-wheel switcher, separate tender, 200 lb. steam; built 1913.
50-ton Baldwin 6-wheel switcher, separate tender; built 1907.
43-ton Baldwin 6-wheel switcher, separate tender, 180 lb. steam; built 1917.
35-ton Baldwin 4-wheel switcher, separate tender, 180 lb. steam; built 1921.
42-ton American 4-wheel saddle tank, 180 lb. steam; built 1910; Ohio boiler.
31-ton Baldwin 4-wheel saddle tank, 160 lb. steam; built 1914.
21-ton Porter 4-wheel saddle tank; built 1912. 36" gauge.

REBUILT DUMP CARS

20-yard all steel Western air dump, vertical cylinders. Ten of these.
12-yard steel underframe hand dumps. Seven of these.
6-yard steel underframe hand dumps. Eight of these.

REBUILT LOCOMOTIVE CRANES

22½-ton Ohio 8-wheel 2-line; built 1915.
20-ton Link-Belt 8-wheel, 2-line; built 1916.
15-ton Ohio 8-wheel, 2-line; built 1919.

BIRMINGHAM RAIL & LOCOMOTIVE COMPANY
Birmingham Alabama

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED—POSITIONS VACANT
Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, thirty inches to the page.

CLASSIFIED—Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

USED EQUIPMENT

MACHINERY FOR SALE

ROTARY CRUSHERS
Three No. 0, Three No. 1, One No. 1½, One No. 2 Sturtevant Rotary Fine Crushers, Three No. 0, One No. 1 Sturtevant Ring Roll Mill, One No. 2 Duplex Sturtevant Ring Roll Mill.

GYRATORY CRUSHERS
All sizes from No. 2 Reduction up to 12K.

JAW CRUSHERS
One 2"x6", Two 7"x10", Two 9"x15", One 6"x20", One 10"x15", One 10"x20", Two 12"x24", One 13"x30", One 15"x36", One 18"x36", One 24"x36", One 22"x50", One 36"x48", One 40"x42", One 60"x84".

CRUSHING ROLLS
One 8"x6", Two 16"x10", Three 30"x10", Two 36"x16", Two 42"x16", One 54"x24", Two 14"x20", and One 24"x12" Crushing Rolls.

DRYERS
One 3'x20', Three 4'x30', One 5'x40', Two 5½'x 40', One 6'x60', One 7'x60', and Two 8'x80' Direct Heat Rotary Dryers, One 5'x25', One 6'x30' Ruggles Coles type "A" and One 4'x 20' Ruggles Coles type "B" Double Shell Rotary Dryers, Three 6'x25' Louisville Dryers.

KILNS
One 4'x40', Two 6'x60', Two 6'x90', One 6'x 100', One 6'x120', One 7½'x80', Three 8'x 125'.

HARDINGE MILLS
Two 3', Three 4½', Three 6' and Two 8' Hardinge Mills.

SWING HAMMER AND TUBE MILLS
Fuller, Griffin and Raymond Mills, Screens, Air Separators, etc.

SPECIAL
One No. 6 Williams Universal Pulverizer.

THE HEINEKEN ENGINEERING CORP.
95 Liberty St. New York City
Telephone Hanover 2450

CRUSHER
Acme 10x18 Portable with Elevator, Screen and Hopper. N. M.

DREDGE PUMPS
2—American, 15 inch, A. C., motor drive. N. M.
2—Morris, 8 inch, steam drive. G.
2—Morris, 6 inch, steam drive. G.

CENTRIFUGAL WATER PUMPS
10—Allis Chalmers, 10 inch, 180 ft. head, motor drive. N. M.
1—Morris, 12 inch, steam drive. G.
1—Morris, 3 inch, 320 ft. head, motor drive. N. M.

DRAGLINES
Bucyrus, Class 24, Electric. N. M.
Bucyrus, Class 14, Steam. N. M.
P. & H., 206, Gasoline Caterpillar. N. M.

DUMP CARS
4—Western, 6 yd., standard gauge. S. C.
8—K. & J., 4 yd., 36 inch gauge. G.

STEAM HOISTS
2—Stroudsburg, 8¼x10, D. C., 3 drum. N. M.
4—American, 7x10, D. C., 2 drum. G.
2—Lambert, 5½x8, D. C., 2 drum. G.
All with or without Boilers.

STONE SCREEN
1—Heavy Duty, 3 ft. x 12 ft., Roller type, A. C., motor drive. N. M.
N. M. items located at New Milford, Conn.
G. items located at Golconda, Ill.
S. C. items located at Sioux City, Iowa.

For prices or information address
THE U. G. I. CONTRACTING CO.
Attention: R. C. Stanhope, Jr.
Supervisor of Equipment
U. G. I. Bldg. Philadelphia, Pa.

GASOLINE SHOVEL & CRANE
1—P. & H. Model 206, ¾ yd. Shovel, crawling tread with 38 ft. clam shell or drag line boom with ¾ yd. drag line bucket. This outfit purchased new; used a few months on one job only.

WELL DRILL
1—Cyclone portable gasoline driven Well Drill with all equipment for 6" holes. Used two weeks.

A. J. O'NEILL COMPANY
406 Weightman Bldg. Philadelphia, Pa.

New—Standard Make
1½ cu. yd. Steam and Electric
SHOVELS
At Greatly Reduced Prices

A two motor electric shovel equipped with 50 hp. hoist and swing motor, and 20 hp. crowd motor. High lift—heavy duty—factory guaranteed.

Also a new heavy duty, high lift steam shovel. Can be equipped with boom up to 32 feet in length.

Either machine recommended for severe operation requiring large output.

Terms to Meet Your Convenience

CHAS. F. COHEN
132-5 Cornell Ave. Elyria, Ohio

In stock 250—24" gauge 2-way Western and Austin dump cars, one and one and one-half yard capacity, in good serviceable second-hand condition. Also a number of new "V" shaped dump cars, 24" gauge: rails, new and relaying and all sorts of tracks supplies of all sections.

Park Row Bldg. New York City — **M. K. FRANK** — Union Trust Bldg. Pittsburgh, Pa.

MACHINERY FOR SALE

JAW CRUSHERS—2½x4; 4x12; 8x10; 9x15; 10x20: 12x24; 13x30; 24x36; 30x42; 60x84.

GYRATORY CRUSHERS—All sizes, various makes.

CRUSHING ROLLS—8x5; 20x14; 21x11; 24x 10: 24x14; 30x16; 36x16; 42x16.

DRYERS AND KILNS—Single shell—3½x16; 4x20: 4x30; 4'9"x36; 5x25; 5x50; 5½x40; 6x 40: 7x70; 7x100; 8x80; 9x124; Double shell—3x16: 4x20; 5x30; 6x40; 8x85.

TUBE MILLS—3'x12", 4x16; 5x20; 5x22; 5'6" x16: 5'6"x20.

HARDINGE MILLS—3'x8"; 4½x16; 5x22; 6x 22: 8x30; 8x36; 8x48.

PULVERIZERS—2-, 3-, 4-, 5-roll, high and low side Raymond Mills, also Beater types; 33" to 42" Fuller Lehigh Mills, Griffin Mills.

SWING HAMMER MILLS—All sizes—Williams, Jeffrey, Gruendler, Pennsylvania.

Send us your inquiries
Send us a list of your surplus equipment

Consolidated Products Company, Inc.
15-16-17 Park Row N. Y. C. Barclay 0603
Shops and Yards at Newark, N. J., cover 5 acres

500 Tons
30 lb. Rails
Reconditioned
and serviceable as new
Priced to sell now
and all other weights
ZELNICKER IN ST. LOUIS
Locomotives, Equipment, Air Compressors, etc. 9½" Locomotive Type Air Compressors, thoroly overhauled, $77.50 ea.

RAILS New and Relay
ALL WEIGHTS AND SECTIONS
FROGS—SWITCHES—TIE PLATES
S. W. LINDHEIMER
38 S. Dearborn St. Chicago, Ill

Crushers No. 12, 10, 9, 8, 7, 6, 5, 4
Roll Crushers
84x72, 36x60, 72x30, 18x30
60x84—Jaw Crushers—16x60
36x48—40x42—26x50—24x36—20x34—60x84
12x37—18x36—13x30—7x24—7x16—10x22
DISC CRUSHERS, 48", 36", 24", 18"
3 Oil Engines 200 H. P., New
Other Oil Engines, 50-850 H.P.
¾—1 AND 1½—2½-YD. CAT SHOVELS
5 Ton Crane 70' Span A C Motors
AIR COMP.—HOISTS—KILNS
DRAG LINES—LOCO. CRANES—MOTORS
Ross Power Equipment Co.
13 South Meridian St. Indianapolis, Ind.

Air Compressors
Three Chicago Pneumatic, 212 ft., 80 to 100 lb. air pressure, Type N-SO2, direct Diesel oil engine driven, on 4 steel wheels, air tank, water tank, $975.00 each, f.o.b. St. Louis.

Hyman-Michaels Company
Peoples Gas Bldg. Chicago, Ill. — Railway Exchange St. Louis, Mo.

CLASSIFIED ADVERTISEMENTS

USED EQUIPMENT

3—Clyde 82 H.P. Single Fric. Drum Electric Hoists.

Drum 26-in. diam. x 30 in. face; 82 hp. G. E. hoist, motor 3 ph., 60 cy., 220-440 volts, duty 7000 lb. hoist; 300 ft. p. m.; steel gears. Like new. For inclines, car pullers, hoisting, etc.

Hyman-Michaels Co.

Peoples Gas Bldg. Chicago, Ill. — Railway Exchange St. Louis, Mo.

RAILS
New and Relayers
New Track Accessories
25,000 TONS IN STOCK
QUALITY GUARANTEED
"1 TON or 1000"
L.B. FOSTER Co.
NEW YORK - PITTSBURGH - CHICAGO

CRAWLER SHOVELS

2—ERIE B-2 DREADNAUGHT, Steam Caterpillar, New 1927, 1-yd. Dippers, HIGH LIFT; Overhauled, Like New.

2—OSGOOD HEAVY DUTY (1-yd.) GASOLINE Caterpillar, 1-yd. Dippers; HIGH LIFT, Excellent Condition.

CRANES

1—NORTHWEST, Model No. 105, GASOLINE Caterpillar Crane, New 1926, 40-ft. Boom, Bucket operating, Overhauled, Excellent condition.

2—25-ton, 8-wheel INDUSTRIAL, Type G, Locomotive Cranes, New 1927, 50-ft. Booms.

DUMP CARS

25—5-yd., 36" gauge, WESTERN, two-way side dump, new 1927; STEEL DRAFT BEAMS; used few months; perfect condition.

Grey Steel Products Company
111 Broadway New York, N. Y.

UNIVERSAL CRUSHER COMPANY
Eastern Agents

All Steel Jaw Crushers. Also used equipment in crushing and power lines.

HOOPER-MOMBERGER CO.
90 West St., New York City Phone Rector 2919

Separate Electric Swingers

Why buy new when we can sell you the equivalent in operating value at much less than half price.

T. H. LETSON CO.
50 Church Street New York

Bargain Prices
100,000 Lbs. Capacity
ALL STEEL ORE HOPPER DUMP CARS
MCB condition. Ready for service.
Cheap freight to any part U. S. A.
DULUTH IRON & METAL COMPANY
Duluth, Minn.

USED EQUIPMENT

FOR SALE

SPECIAL—4½x12' Allis-Chalmers Tube Mill, trunion feed and discharge, water cooled bearings, with driving mechanism and new manganese lining.
4½x52½' rotary dryer.
8'x80' rotary dryer.
4x30, 80"x45' and 8'8"x85' Ruggles-Coles Class A Dryers.
3-, 4- and 5-roll Raymond Mills.
No. 1, No. 00 and No. 0000 Raymond Mills.
6x22 and 8x48 Hardinge Mills.
42"x40' rotary kiln, cement lined.
4x30 American Process steam dryer.
30"x13" Farrell Jaw Crusher.

ROBERT P. KEHOE MACHINERY CO.
7 East 42nd St. New York, N. Y.

Special Bargains in Used Machinery

1—Gates Gyratory Crusher, No. 6, Style D.
1—Wet Chaser Mill, 8 ft. Double Discharge.
1—Wet Chaser Mill, 6 ft. Single Discharge.
1—Ruggles-Cole Dryer, 60 in. x 24 ft.
1—Ingersoll-Rand Steam Driven Air Compressor, 14 x 14½ x 18.
1—Curtis Air Compressor, Belt Driven (about 60 cu. ft. per M.).
1—Steam Engine, L. H. Drive, 75 H.P.
1—Steam Engine, 16x21.
1—Electric Triplex High Pressure Pump, 200 gal. per minute.
1—General Electric Generator, 170 H.P., 2300 v.
1—Jeffrey Radial Wagon Loader, Electric Traction.
1—Miscellaneous Assortment Shafting, 2-11/16 in. to 3-11/16 in.
1—Miscellaneous Assortment of Pulleys.

DECKERS CREEK SAND COMPANY
P. O. Box 186 Morgantown, W. Va.

STEEL DERRICK

1—20-Ton Steel Guy Derrick with 70' Boom. Very well made and very low in Price.

T. H. LETSON CO.
50 Church Street New York

FOR SALE
No. 175 Bucyrus Shovel

75 ft. boom, 50 ft. stick, 3½ yd. bucket. Now operating on coal stripping job near Hickory, Pa. In best possible condition and can be inspected under steam. Price right.

BENTZ BROS. Hickory, Pa.

USED EQUIPMENT WANTED

WANTED

One jaw crusher 36x48 in. or larger. One 1¼ yd. steam shovel on caterpillar.

Address Box 131, care of Rock Products
542 So. Dearborn St. Chicago, Ill.

Wanted—Dryers and Mills

Two Rotary indirect heat type, similar to Ruggles-Coles "B" or Christie for clay. Also Raymond 5-roll Mill. Give price, specifications, location, age, etc.

Address Box 130, care of Rock Products
542 South Dearborn Street Chicago, Illinois

Used Equipment Wanted
If in need of good used equipment make your wants known here and see how quickly you can fill them at reasonable cost.

BUSINESS OPPORTUNITIES

Quarry for Sale

227 Acres of the Famous Oolitic White, High Calcium Limestone in Ste. Genevieve County, Missouri. The reputation of this particular stone is National in scope, for all purposes, and needs no analysis to prove it. Property can be purchased at a very reasonable price.

Address Box 128, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

For Sale—Sand and Gravel Plant

Well established sand and gravel plant in eastern Arkansas on Rock Island R. R. Lots of business in sight. For particulars write

W. A. BRIDEWELL
622 Falls Building Memphis, Tenn.

FOR SALE

Sand and gravel plant with leases. Established business, Benton, Ark., near center of state; two railroads; several years of large road program ahead.

Write E. L. HUDDLESTON
2204 Summit Ave. Little Rock, Ark.

PARTNER WANTED

Sand lime brick plant, building of steel frame and brick, unlimited amount of pure silica sand, make a fine hard brick, all machinery ready to run, cheap labor. No brick plant nearer than 60 miles. Albany alone uses a good many millions of brick each year.

ALBANY BRICK CO., Albany, Ga.

UNDEVELOPED DEPOSITS

Drummonds Island, Chippewa County, Michigan, 187¾ acres of land on the north shore near the east end of the island. Dolomite, limestone, dolomitic limestone, beach gravel. For fluxing iron ores, road material, concrete, railroad ballast, refining wood pulp. Undeveloped.

W. F. COOPER
333 So. Capitol Ave. Lansing, Mich.

THESE columns offer you the best medium in the rock products industry for the sale, exchange and purchase of used equipment, rock, quarry and gravel-pit property; the circulation and buying influence of Rock Products extends beyond those now actually engaged in operating plants; it includes mining engineers and capitalists who may be reached through no other medium, because of Rock Products' world-wide reputation as the *business journal* of the rock products industry.

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INFORMATION
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POSITIONS VACANT

FIRST CLASS DESIGNER
Familiar with Dust Arresters

—Who is between 35 and 40 years old.
—Who is a graduate Mechanical Engineer.
—Who has a thorough knowledge of Fan Operation, preferably experienced in Dust Handling Problems, also in making Piping Lay-Outs, etc., and has proven ability as a Designer.
—Who would be capable of taking a leading part in the designing of a line of Cloth Screen and other types of Dust Arresters, also Apparatus for Classifying and Conveying of Materials by Air.
—Who has had experience in surveying new fields to determine potential possibilities, and preferably some shop experience.
—Who has a pleasing personality, is an enthusiastic worker, inspires confidence, and holds friends.
—Who "gets on" well with fellow workers.
—Who inspires the best in others, is an orderly, efficient worker, and a capable supervisor.
—Who would do justice to an out of the ordinary opportunity.
—Who now holds a good position, which he had no idea of leaving.
—Who would enjoy working in a happy business family of young men, where due appreciation is shown for work well done.

The Company seeking this man is a successful, well established enterprise, enjoys first rating, and a high class concern in every sense.

In your first letter give age; education; places employed, duties and salary received; periods of employment and reasons for leaving in each instance; also send photograph and state salary expected.

Your letter will be treated strictly confidential, and no one communicated with before receiving your consent. Prompt interview will be arranged if qualifications suit.

Address Box 120, care of Rock Products
542 South Dearborn Street Chicago, Illinois

Sales Engineer

An unusual opportunity awaits a graduate engineer 33-40, who has proven that he is a real salesman and has a thorough knowledge of Fan Engineering and Dust Collecting. Send full particulars of education, places employed, duties, salary, etc. Replies will be treated in strict confidence.

Box No. 121
Care of Rock Products
542 S. Dearborn St., Chicago, Ill.

MANAGER WANTED—PARTY WISHING to retire from active management wants young man with executive ability who understands rock crushing business to take full charge of going plant. Must furnish good references and be financially able to take a third or half interest in the plant. Not over $5000 required. Unlimited market for product. Address Box 133, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

WANT QUARRY FOREMAN—EXPERIenced in drilling and blasting rock and operating electric shovels to come with a live and fast growing organization. Must be able to handle men. In first letter give references and where now employed; also salary expected. Address Box 125, care of Rock Products, 542 So. Dearborn Street, Chicago, Ill.

WANTED—A CHEMIST WITH BROAD EXperience in lime industry. Lime rock and burning. State age, nationality, full experience and references. Address Box 126, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

POSITIONS VACANT

Sales Engineer

Active, energetic, approximately 30 years of age. Must have engineering knowledge or experience with crushed stone, sand and gravel plants and conveying machinery. Give full details in first letter, stating age, experience, college education, if any; if married, and salary. Good position open. No experimenters or triflers. Address

Box No. 122
Care of Rock Products
542 South Dearborn Street Chicago, Illinois

POSITIONS WANTED

AVAILABLE, YOUNG MAN WITH BROAD experience as production clerk and assistant superintendent wishes to make permanent connection with company that will recognize executive ability in the handling of plant shipments, payrolls, operating costs, books and correspondence. Familiar with all phases of crushed stone industry. An adaptable and energetic hustler that can assure efficient results. Address Box 96, care of Rock Products, 542 So. Dearborn Street, Chicago, Ill.

WANTED—POSITION AS CHIEF CHEMist in cement plant. Have had broad experience in the cement industry with 18 years actual operation. Thorough knowledge of quarry and mill supervision, burning with oil or coal, wet or dry process. Age 37 and married. Can furnish complete record with best of reference. Address Box 100, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

POSITIONS WANTED

SUPERINTENDENT—DESIRES ENGAGEment; thoroughly familiar with stone crushing, sand and gravel operations; competent and efficient operator; location South or West. Prefer working on bonus basis or tonnage contract. Excellent references. Address Box 99, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

ENGINEER, EXPERIENCED IN DESIGN, construction and operation; cement, lime, crushing, pulverizing, conveying, ore handling and treating plants. Considerable experience in other industrial manufacturing lines. Address Box 2253, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

SUPERINTENDENT—YOUNG MAN WITH thirteen years' experience in charge of quarry and crushing operations in limestone and trap rock. Considerable experience in plant construction. Can produce results. Willing to start for moderate salary. Excellent references. Address Box 134, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

MAKE YOUR WANTS KNOWN

ROCK PRODUCTS is the business journal of the rock products industry; its readers are men of influence, and their buying power is big. An advertisement in this classified department will be seen and read. Make your wants known and see how quickly they will be satisfied.

To Employers Who Advertise for Men:

These advertisements of "positions vacant" and "positions wanted" are all bona fide, and in a large majority of cases from firms and men known personally to one or more of the staff of Rock Products.

It sometimes happens, when an employer receives a number of applications for a position open, he neglects to acknowledge some of them.

As a matter of courtesy and good will in our relatively small and closely knit industries, the applicant should receive some acknowledgement. If the employer does not wish to disclose his identity he may make the acknowledgement on plain letter paper.

The applicant is, in practically every instance, a bona fide operating man in the rock products industry. Otherwise he would never see a copy of Rock Products, as it has no circulation outside of those definitely interested in the production of these commodities.

Unless the applicant receives some acknowledgement he does not know that his application forwarded through Rock Products has been properly taken care of or not; and a very good candidate for some future employment is discouraged from answering these blind advertisements, to the detriment of both employer and employe.

Therefore, for the good of all our industry, employers and employes, please treat such applications with the same courtesy you would any other business communication.

—The Publishers.

Dredge Efficiency Greatly Increased

...with the Eagle "SWINTEK" Suction Screen Nozzle

Wherever boulders or debris interfere with dredging by suction methods, the Eagle "SWINTEK" Suction Screen Nozzle Ladder provides the most efficient means of eliminating this troublesome problem.

This equipment gives positive assurance of **continuous operation**—with the natural results of **greater output** and **more profit.** The suction nozzle cannot possibly be clogged—since the "SWINTEK" loosens and agitates the deposit, and carries away by means of a traveling screen everything that might otherwise clog the nozzle.

Your inquiries are solicited

For obtaining greatest efficiency and economy in washing operations, EAGLE SAND AND GRAVEL WASHERS are unequalled. Ask for bulletin.

EAGLE IRON WORKS ~ ~ Des Moines, Iowa

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